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A MANUAL

OF

DISEASES

OF THE

THROAT AND NOSE

BY

FRANCKE HUNTINGTON BOSWORTH, A.M., M.D.,

LECTURER ON DISEASES OF THE THROAT IN THE BELLEVUE HOSPITAL MEDICAL COLLEGE AND PHYSICIAN-IN-CHARGE OF THE CLINIC FOR DISEASES OF THE THROAT IN THE OUT-DOOR DEPARTMENT OF BELLEVUE HOSPITAL; FELLOW OF THE NEW YORK ACADEMY OF MEDICINE, OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION, AND MEMBER OF THE MEDICAL SOCIETY OF THE COUNTY OF NEW YORK.

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To

JAMES R. WOOD, M.D., LL.D.

EMERITUS PROFESSOR OF SURGERY IN THE BELLEVUE HOSPITAL MEDICAL COLLEGE,
ONE OF ITS FOUNDERS, AND THE FIRST TO ORGANIZE SYSTEMATIC
CLINICAL INSTRUCTION IN SURGERY IN
BELLEVUE HOSPITAL;

AN ACCOMPLISHED SURGEON; A SUCCESSFUL TEACHER; AND A TRUE FRIEND;

This Volume is Affectionately Dedicated,

BY HIS

FORMER PUPIL.

PREFACE.

I HAVE embodied in the following pages the results of an experience, in dealing with throat affections, extending now over nearly ten years, and which has embraced the observation, treatment, and, in the large proportion of instances, the observed results of treatment, of something over eight thousand recorded cases. These have been partially in private practice, but mainly at the Bellevue Clinic for Diseases of the Throat. In making these results public, I have endeavored to confine myself to my own personal experience, recording, with candor and fidelity, both the method and measure of my success in those affections in which success has followed treatment, and, at the same time, and with the same candor, acknowledging the difficulties and disappointments which have attended the management of those diseases in the treatment of which I have failed of full success.

In describing special methods of treatment, I have endeavored to enter into full detail, preferring to err in this direction, rather than to fail of making myself clearly understood. The methods recommended are all such as I have made use of, and with the result given; the methods recommended by others, I have, as a rule, passed over, except when I have found them of value.

In the classification of diseases, I have followed that plan which is based on the general laws which govern the manifestation and development of morbid processes in all mucous

membranes, and which at the same time harmonizes most completely with clinical observation. This is outlined in the chapter on mucous membranes, but may be briefly noticed here. An inflammation of a mucous membrane manifests itself in the catarrhal, croupous, or diphtheritic form. A catarrhal inflammation may be acute or chronic, while the latter forms are always acute. A chronic catarrhal inflammation develops certain structural changes in the deep layer of the membrane, which may expend themselves in the membrane proper, constituting a chronic catarrhal inflammation, or they may expend themselves in the glands and follicles, constituting a chronic follicular inflammation. The croupous form of inflammation consists of a morbid process which is attended with an exudation which coagulates; if this is poured out on the surface a false membrane is formed, if it occurs in the glands or follicles, an acute follicular inflammation is the result. Diphtheritic inflammation occurs only in connection with blood-poisoning, as in diphtheria.

If now we turn to observed clinical facts, we find that inflammatory affections involving the lining membrane of the upper air tract, whether of the nose, pharynx, or larynx, obey these general laws, except so far as they are modified by differences in the anatomy of the membrane, and the functions and environment of the part. Certain parts are richly endowed with follicles, as the pharyngeal vault, the lower pharynx, and that portion of the fauces which is called the tonsil; hence, in these regions we find there is an especial liability to the occurrence of follicular disease, both acute and chronic. The nasal cavities proper, and the larynx, on the other hand, are especially subject to purely catarrhal inflammation, and not, as a rule, to the follicular disease.

We may then summarize somewhat briefly:

Acute catarrhal inflammation may occur in the nose, pharynx, or larynx, resulting in acute coryza, acute pharyngitis, acute laryngitis, etc.

Chronic catarrhal inflammation may occur in any portion of the air-passages, resulting in chronic coryza, chronic pharyngitis, chronic laryngitis, etc.

Acute follicular inflammation may occur in the upper or lower pharynx, or in the tonsils, resulting in acute follicular tonsillitis, acute follicular pharyngitis, etc.

Chronic follicular inflammation may occur in the pharynx or tonsils, resulting in chronic follicular pharyngitis, enlarged tonsils, etc.

Croupous inflammation may occur in the pharynx or larynx, resulting in croupous pharyngitis or membranous sore throat; or in croupous laryngitis, or true croup.

Diphtheritic inflammation may occur in any portion of the upper air tract, as a local manifestation of the blood disease, diphtheria.

This in brief is the plan which I have followed in the classification of the inflammatory affections of which the following pages treat. In this manner, that nomenclature is dispensed with which includes such names as acute and chronic sore throat, granular sore throat, granular pharyngitis, clergyman's sore throat, etc. These names, it seems to me, are indefinite, and somewhat meaningless, and should therefore not be used. On the other hand, in the classification which has been adopted, the name of the disease expresses fully the character of the morbid process and the elemental constituent of the membrane, as well as the region, involved. In those affections in which there occurs two grades of acute inflammation, as in acute and subacute tonsillitis, I have used the prefix to characterize the degree of the inflammatory process. This is occasionally used to denote a process midway between the acute and chronic; it seems to me preferable that it should qualify the type of the morbid activity, and describe an inflammation still acute, but of a mild form.

It was not my design, in undertaking this work, to prepare a complete treatise on the throat, but rather to describe those

affections met with in ordinary practice ; I have for this reason omitted many diseases which perhaps may more properly belong in a work of the dimensions to which this has unintentionally grown, notably diphtheria and the throat manifestations of the exanthemata ; these, I have thought, more properly belong to general medicine, and I have omitted them.

I have departed somewhat from the original plan of the book, in treating of some subjects at considerable length, as laryngeal phthisis, bilateral paralysis of the abductors, etc. I have done this designedly, with the object of introducing personal views and methods of treatment which are not given in other works, and which I regard as worthy of consideration.

I am under obligation to Dr. J. Solis Cohen, of Philadelphia, for his kindly permission to make use of the excellent woodcuts which I have borrowed from his work on The Throat. I am also under obligation to Dr. Morrell Mackenzie, for the woodcuts which I have appropriated, without permission, from his recent work on The Throat and Nose. My excuse for this is, that his work appeared in this country after my manuscript had been sent to the printer, and the cuts have been inserted while the book has been going through the press ; my time was too limited to await a response, and it would not have been a very gracious act to seek his permission to use them after I had already appropriated them.

I trust that Dr. Mackenzie will accept this explanation, with the additional excuse that the exceptional character of the illustrations of his work proved a still greater temptation to me to make use of them.

F. H. B.

No. 26 West Forty-sixth Street,
New York City.
January 1, 1881.

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INTRODUCTION.

The discovery of instruments of precision has always been followed by marked progress in that branch of medicine which they have been designed to serve, and perhaps in no department has this been more striking than in that of diseases of the throat; for what was, in the main, vague guesswork formerly, has now become exact knowledge by the aid of the laryngoscope, and we may view with no little satisfaction the amount of genuine work, in the direction of careful clinical observation of diseases of the upper air-passages accomplished since Prof. Czermak, of Pesth, first demonstrated the practical working and value of this instrument in these affections. To Czermak is undoubtedly due the credit of placing the instrument in the hands of the profession, and proving it a valuable aid in the diagnosis and treatment of diseases of the throat, although Garcia discovered it, and Tuerck, of Vienna, first attempted to make clinical use of it.

Various attempts had been made by physicians, dating back as far as the early part of the eighteenth century, to examine the larynx during life by means of the small dentist's mirror introduced into the throat, and similar methods, but all without success, until in 1854 Manual Garcia, a distinguished singing-master of London, conceived the idea of studying the movements in the larynx in phonation by means of a mirror introduced into the fauces, and succeeded so well that he prepared and read before the Royal Society of London an excellent description of the physiology of the voice and the

respiratory movements of the larynx, in a paper entitled "Physiological Observations on the Human Voice." Garcia made his observations on his own person by standing in such a position that the direct rays of the sun would fall upon a small dentist's mirror introduced into the throat, and then, by means of a hand-mirror held before his face, he obtained a view of the image formed on the throat-mirror. Little attention was paid to Garcia's observations at the time, but in 1857 Prof. Tuerck, of Vienna, pursuing Garcia's method, made some experiments with the little mirror, but failed to attain any marked success in his observations, and finally abandoned the idea as impracticable. Subsequently, in the same year, Prof. Czermak, of Pesth, took up the matter where Tuerck had left it, and, by substituting artificial light for sunlight, and making use of the ophthalmoscopic mirror to reflect and condense light upon the small mirror placed in the throat, fully and completely demonstrated the practical value of the instrument.

Mackenzie places at the head of the opening chapter of his work on "The Laryngoscope" this apt quotation: "Honor belongs to the first suggestion of a discovery, if that suggestion was the means of setting some one to work to verify it; but the world must ever look upon the last operation as the crowning exploit" (Bain).

To Garcia, then, as the inventor of the laryngoscope, all honor is due; but equal credit is due to Czermak, who demonstrated its practicability and placed it in the hands of the profession, as a most valuable aid in the diagnosis and treatment of diseases of the upper air-passages.

DISEASES OF THE THROAT AND NOSE.

CHAPTER I.

THE USE OF THE LARYNGOSCOPE.

The Laryngoscope.

The laryngoscope consists of three essential parts:

1. *The laryngeal mirror.*—A small mirror attached to a slender rod, which being placed in the back part of the throat reflects light upon the parts below, and at the same time receives back the illuminated image.

2. *The reflecting mirror.*—A concave mirror which is placed upon the forehead of the observer, or upon a fixed apparatus, in such a manner as to throw a strong light upon the laryngeal mirror placed in the throat.

3. *The light.*

1. *The laryngeal mirror* is a small round mirror encased in a German silver case, and attached by its rim to a slender wire stem at an angle of 120°; the whole measuring about 6–7 inches in length. They are made in sizes from $\frac{1}{8}$ inch to $1\frac{1}{4}$ inch in diameter, and are numbered from 1–4, as shown in Fig. 1, actual size.

They are made of various shapes, such as oval, square, etc., but the round mirror is best adapted for all purposes. In selecting a mirror, it is well to choose one having a clear glass, a narrow rim which will give the largest reflecting surface to the smallest bulk, and a stout stem which will allow of the use of considerable force without bending.

As to sizes, if but one is purchased, No. 3 is the most desirable; if two, Nos. 2 and 4 should be selected.

2. *The reflecting mirror* is a concave mirror from three to six inches in diameter, which should have a focal distance of about twelve to fifteen inches.

It is perforated in the centre to allow of the observation being made in exactly the line of illumination, as will be

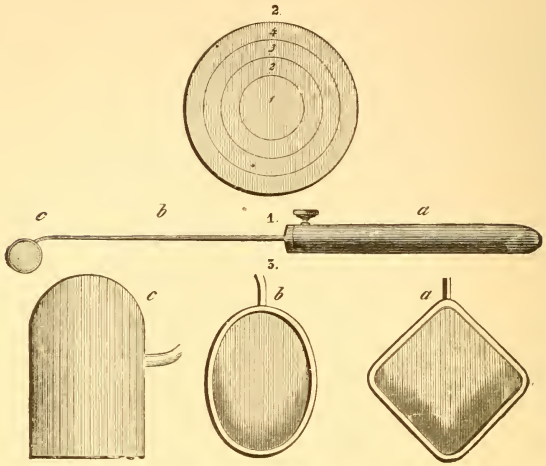

FIG. 1.—1. The laryngeal mirror; *a*, handle; *b*, stem; *c*, mirror. 2. Actual sizes of the round mirror in ordinary use. 3. Varying shaped mirrors. *a*, square (Czermak); *b*, oval; *c*, according to Bruns. (Ziemssen.)

noticed farther on. Its object is to receive the rays of light and converge them upon the laryngeal mirror placed in the fauces. It may be mounted on a flexible bar as in Tobold's apparatus to be described; or it may be mounted on a band by a universal joint and fixed upon the forehead. Fig. 2 represents Schroetter's head-band. A stout band passes around the head and is fastened with a buckle. In front there is attached a thick pad which lies against the forehead, with two smaller pads below which rest upon the bridge of the nose. From the metal plate upon which the pads are constructed there projects in front a split socket, regulated by a screw, which receives a ball attached to the reflecting mirror. In this man-

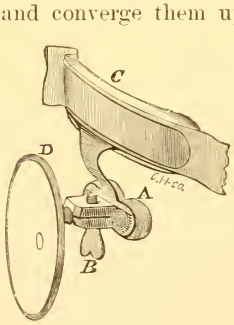

FIG. 2.—Schroetter's head-band and mirror.

ner the mirror may be held in any position or direction in front of either eye.

A simpler head-band is the Pomeroy head-band shown in Fig. 3, constructed on much the same principle, but simpler and lighter.

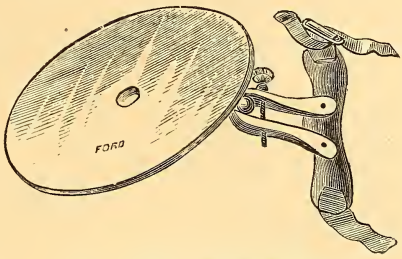

Fig. 3.—Pomeroy's head-band and mirror.

In both of these head-mirrors, the knob which is received into the split socket of the head-band projects from the back of the mirror frame; the result is that the whole weight falls upon the forehead, rendering it necessary to draw the band around the head quite closely. In prolonged examinations this becomes wearisome and even painful.

I have had made for my own use a mirror, in which the knob, which fits into the split socket, is attached to the periphery of the mirror frame as shown in Fig. 4. The head-band is similar to Pomeroy's (Fig. 3), but much smaller and lighter, and is supplied with a narrow elastic tape which binds the head very gently. The whole affair is perfectly flat, and can be easily carried in the vest pocket. It also admits of a more universal motion of the mirror on the head-band. In using it the edge of the mirror rests upon the side of the nose.

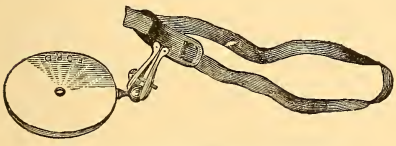

Fig. 4.—The author's head-band and mirror.

A method of arranging the forehead-mirror, much in vogue among the English, is by means of a spectacle frame shown in Fig. 5. This makes a rather cumbrous affair, however, and one only adapted for office use.

3. *The light.*—This may be sunlight, gas, coal oil, or the oxy-hydrogen light. If gas is used, the Argand burner gives the steadier and better flame. Sunlight affords by far the best light, being more powerful than gas or oil, and giving a perfectly white light which does not discolor the parts to be ex-

amined, gas and oil always giving a deeper red color to the mucous membrane which it illuminates, than normally belongs to it. Sunlight should always be used, therefore, for an examination when it is feasible.

For its simplicity, and from its being always attainable, the German student lamp with coal oil will be most generally used, the coal oil giving a clear, bright, almost white light.

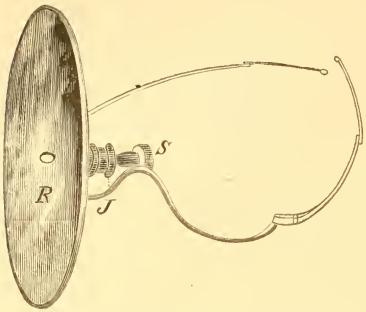

FIG. 5.—Head-mirror attached to a spectacle frame. At the back of the head-mirror (R) is a small cup into which a ball, connected with the spectacle frame, fits. A ring is screwed over the ball, and the joint is thus formed at J. (Mackenzie.)

For office use, various instruments have been devised for modifying and improving the light, but with questionable success. The oldest and most prominent of these is Tobold's Laryngoscope, shown in Fig. 9. It consists of a metal cylinder containing at its proximal end two double convex lenses, with a single lense of larger diameter at the distal end, the cylinder being attached to a hood which fits over the flame of the student lamp, and is attached by a rod to the standard. To the standard is also attached a jointed and movable arm which supports the reflecting mirror at its distal end, in such a manner, that it may be placed at any angle in front of the lens and reflect the light in any desired direction. What optical principle is employed in the arrangement of the lenses of Tobold's apparatus I have never been able to determine.

Dr. Sass, of New York, has modified this apparatus by combining two plano-convex lenses in a cylinder, in a somewhat similar manner, the plain surfaces of the lenses presenting to the light, the reflecting mirror being supported in a manner similar to the original Tobold's apparatus, by a flexible bar in front of the lens. Sass's apparatus, Fig. 6, gives a very powerful and beautiful light, the main objection, however, to this laryngoscope is its high cost.

A simpler apparatus still is Mackenzie's Light Condenser, shown in Fig. 7; it consists in a simple hood of metal, so

arranged that it may be fitted to any light, a gas jet, a coal-oil lamp, or even a candlestick. At the side of the hood and oppo-

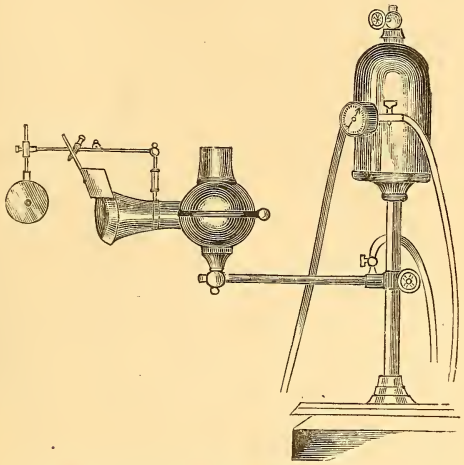

Fig. 6.—Sass's laryngoscope combined with a receiver for compressed air.

site the flame is a fenestrum into which is fitted a plano-convex lens 2½ inches in diameter, and comprising about one-third of a sphere. This may be used as a fixed apparatus by attaching

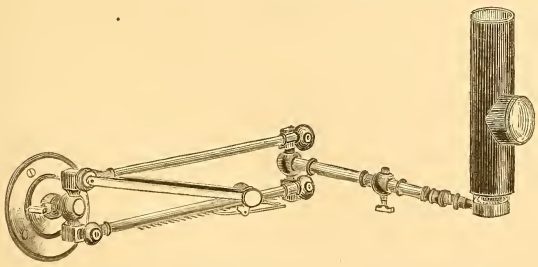

Fig. 7.—Mackenzie's light condenser mounted upon the rack movement fixture.

the flexible bar to the hood and mounting the reflecting mirror upon it; or it may be used in connection with the forehead-mirror. (See Fig. 8.)

In the same plate (Fig. 7) is shown Mackenzie's rack movement fixture for gas, which admits of both lateral and horizontal movement, thus adding very much to the convenience of

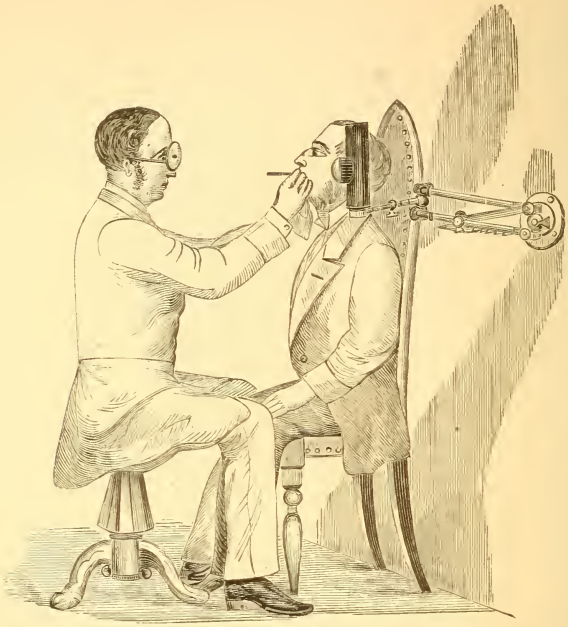

Fig. 8.—Examination by means of the head-mirror and Mackenzie's light condenser. (Mackenzie.)

an examination. To this fixture may be attached the Tobold apparatus, or it may be used with the forehead-mirror, using the Mackenzie condenser, Fig. 8, or even the simple gas jet.

Examination of the Larynx.

If a fixed apparatus such as Tobold's is to be used in making a laryngeal examination, the patient should be seated with the lamp on his right side, and on a level with his mouth; the cylinder of the laryngoscope being directed toward the observer. The reflecting mirror should then be so placed as to reflect the

illuminating rays toward the patient, and in such a manner that they form a disk of light, of which the base of the uvula is the centre, the head being thrown well back and the mouth open. (See Fig. 9.) The tongue should then be seized between the thumb and forefinger of the left hand, a napkin being interposed to prevent its slipping from the grasp, and drawn gently forward; care being taken not to draw too forcibly. If preferred, the patient may hold the tongue himself. The observer should then place his right eye to the opening in the reflecting mirror, the left eye looking beyond its edge. The

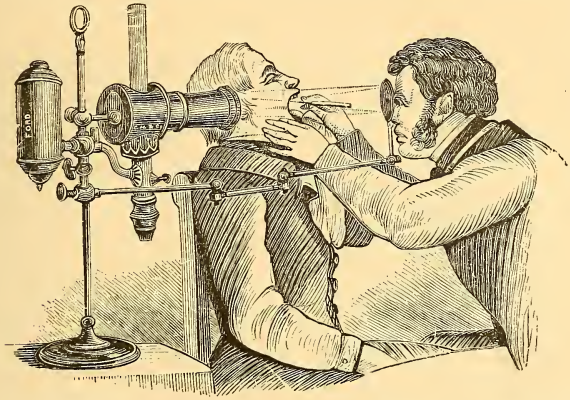

FIG. 9.—Examination by means of Tobold's laryngoscope, mounted on the ordinary student's lamp.

habit should be acquired from the first of holding the face squarely toward the patient and keeping both eyes open, and also of making the observation through the opening in the mirror rather than from one side; for it is in this manner alone that the most perfect view of the parts is obtained as will be noticed farther on.

In making an examination with the forehead-mirror, the patient should be placed in the same position, with the light on his right side and at the level of his mouth. The observer should then arrange the mirror in such a position that it will reflect a disk of light upon the mouth of the patient as before described, while at the same time he can see with perfect ease, looking with the right eye through the perforation in the

mirror, and with the left eye beyond its rim. (See Fig. 10.) It is oftentimes difficult for the beginner to get accustomed to arranging his head-mirror properly; but a little practice will enable him to overcome this first awkwardness. The opening should be placed immediately in front of the eye, in such a way that the patient's mouth can be seen without effort through the perforation in the mirror; then, without disturbing this position, the mirror can be turned until the light is concentrated in the proper direction.

In using the forehead-mirror the head of the observer must be held in a fixed and steady position, of course, while making an examination. The same is also true of the patient. The

FIG. 10.—Examination with the head-mirror by the use of an ordinary gas-jet.

disposition of the patient to move about and thus escape from the line of illumination, may be controlled by this simple device: while the tongue is held between the thumb and forefinger of the left hand, pass the other fingers under the chin and press upward against the bone, while at the same time the forefinger rests upon the lip or gum. In this manner the jaw may be held with considerable steadiness and the head of the patient prevented from moving out of the line of vision.

It is well for the beginner in laryngoscopy to practise some-

what in the management of his light before proceeding to introduce the throat-mirror, and especially with the use of the forehead-mirror, for the advantages of using it over that of the fixed apparatus cannot be overestimated. While the fixed apparatus is only adapted for office use, the head-mirror with the throat-mirror forming a complete laryngoscope, may be easily carried in the pocket, and with the aid of a tallow candle, if nothing better is at hand, a very satisfactory examination can be made wherever it may be needed; and this, too, without regard to the position of the patient, whether lying or sitting.

The light having been properly arranged the next step is to introduce the laryngeal mirror. This should be held easily and gently in the hand, as one would hold a pen. (See Fig. 11.)

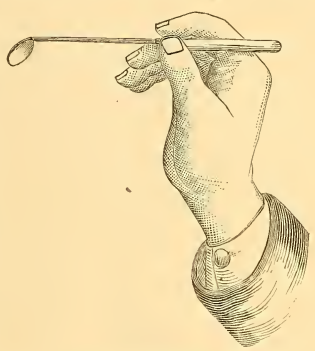

FIG. 11.—Holding the laryngeal mirror. (Mackenzie.)

The mirror should be warmed over the light to prevent the moisture of the breath from condensing upon it, and touched to the cheek or hand to test its temperature, and to prevent its being introduced while too hot. Then with its reflecting surface downward and parallel with the dorsum of the tongue, and the shaft held away from the median line in such a position that it will strike the angle of the mouth, it should be passed back until its edge touches the soft palate. It should then be passed downward and backward until the uvula rests on its posterior surface, when, without changing its inclination, it should be carried upward and backward, carrying the uvula and soft palate with it, until it rests firmly against the wall of the pharynx. This is well illustrated in Fig 12. At the same time the patient should sound a high pitched and prolonged "*ah*"; in this manner the laryngeal cavity is brought thoroughly into view. By sounding a high note the larynx is lifted by muscular contraction, brought into play by the effort, and thereby the epiglottis is raised and uncovers the laryngeal cavity and allows of a freer inspection. It is often directed

that "*E*" or "*A*" shall be sounded in making the examination; many patients in the utterance of these sounds arch their tongues up to such an extent as to completely cut off the view; this does not occur in the utterance of "*ah*." In pressing the mirror against the pharynx it is better to press with a firm

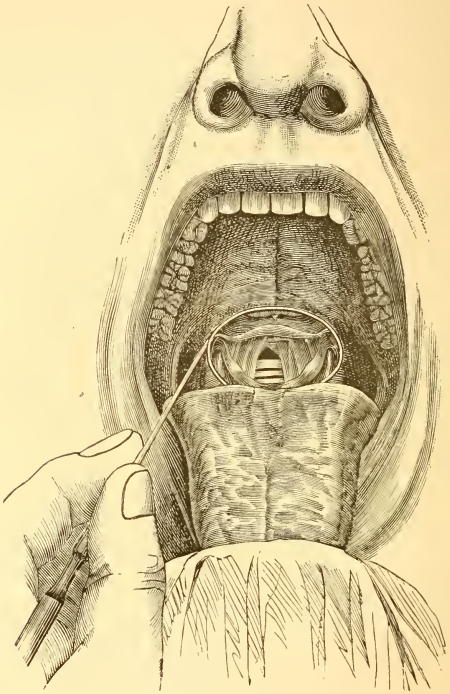

Fig. 12.—The laryngeal mirror in position (Cohen). This plate has been reversed by the wood-cutter, thus showing the mirror held in the left hand.

hand, as there is less danger of causing retching in this manner than if the mirror is held away from the pharynx, and unsteadily.

By reference to Fig 13, the relative position of the parts and the position in which the mirror should be held will be easily understood. The larynx being somewhat in front of the

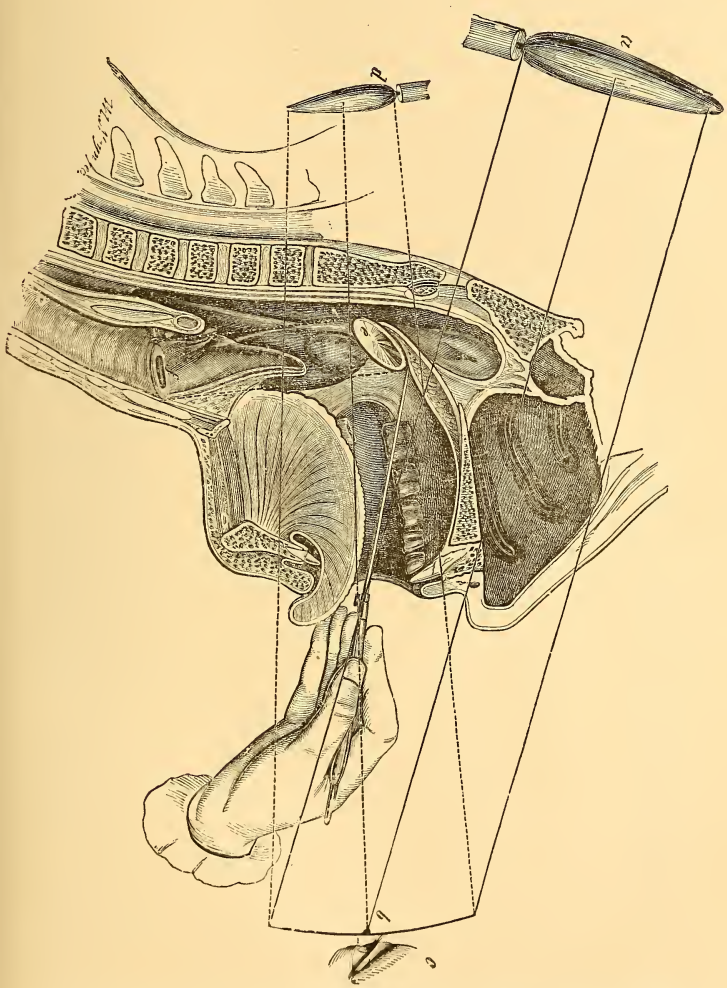

FIG. 13.—The course taken by the rays of light in a laryngeal examination: *a*, flame; *b*, reflecting mirror, *c*, eye: *d*, apparent and projected image of the flame; *e*, laryngeal mirror; *f*, glottis with the rays of light reflected upon it by the mirror in the fauces. (Ziemssen.)

wall of the pharynx, the surface of the mirror must needs be turned at an angle with the line of vision of something beyond 45°. The same diagram also illustrates the course of the illuminating and visual rays. Commencing at the light *a*, the rays successively fall upon the reflecting mirror *b*, then on the hand-mirror *e*, and are finally reflected upon and illuminate the laryngeal cavity at *f*, whence becoming visual rays they travel backward through *e* to the eye at *b*. This also illustrates the importance of using the perforation in the reflecting mirror for making the observation, by which the illuminating and visual rays fall in the same line; for instance, while the illuminating ray passing through *a*, *b*, *e*, *f*, illuminates the point *f*, were the eye placed beyond the edge of the reflecting mirror *b*, the visual rays would fall upon parts which would be found dark and unilluminated.

Fig. 14.—Epiglottic pincette of Von Bruns.

Obstacles to Laryngoscopy.—There are certain difficulties often encountered in practising laryngoscopy which may be briefly noticed.

The epiglottis oftentimes so far overhangs the laryngeal cavity as to very seriously interfere with its satisfactory inspection. To overcome this difficulty various forms of hooks and pincettes have been devised. Fig. 14 represents the epiglottic pincette of Von Bruns. I have never met with an epiglottis that tolerated the use of any of these instruments. On the other hand I have very rarely met with a case which, with a little patience, did not finally yield a fair examination. Other methods failing, the throat may be irritated purposely to such an extent as to bring on retching, when during the act a momentary glimpse of the interior of the larynx may be gained.

Abnormal irritability of the throat is probably the most obstinate and trying of all the difficulties encountered in making a laryngeal examination. This condition is met with in all degrees of severity, from the slight tendency to nausea on the introduction of the mirror, to the violent retching excited by the mere attempt to seize the tongue. Various remedies have been recommended

to overcome this excessive irritability, such as bromide of potassium, morphia, chloroform, ether, swallowing pellets of ice, etc. But in my experience internal remedies are of little avail, and the only method that promises any success is extreme patience and perseverance on the part of the observer in educating the patient to a tolerance of the examination. With the exercise of these qualities he will rarely be disappointed of full success in the end. Much aid, however, may be often gained by simply directing the patient to take short, quick, full respirations; the cool air striking the fauces seeming to cause a slight local anæsthesia; or possibly the acquired tolerance may be due to the mind of the patient being somewhat diverted by the attempt to carry out the directions.

A thick or unruly tongue may at times interfere with the observation by obtruding itself or arching itself up in the line of vision. In these cases resource must necessarily be had in the use of the tongue depressor.

Enlarged tonsils may interfere somewhat with an examination, in which case a smaller mirror must be used.

Elongated uvula.—If an abnormally long uvula exists it may obstruct the view somewhat, but as a rule it can be managed by a quick movement in which the mirror is passed down into the pharynx, and catching the uvula, holds it firmly against the pharyngeal wall. In making an examination it is well to say that the mirror should not be held in place more than from ten to twenty seconds, especially with patients not trained to tolerance of it, as much more will be accomplished by avoiding the wearying of the patient and exciting retching by too prolonged examinations. A moderate amount of studious practice will soon enable one to use the mirror with considerable deftness. Having accomplished this the next step will be the study of the laryngeal image as seen by the mirror in the fauces.

The Laryngeal Image.—At the outset it is well to divest oneself of the usually taught idea that the image in the mirror is reversed, and that right is left, and that the top is bottom, etc. The reversal of the image is simply the same that takes place when one looks in a dressing mirror; and in making a laryngeal examination it is no more necessary to bear in mind that the image is a reversed one than it is in brushing one's hair before a glass.

Anatomy teaches the general relation of the individual parts of the larynx to each other ; and it is well for those needing to refresh the memory of laryngeal anatomy, to refer to their Gray before commencing laryngoscopy, and having done this it will be unnecessary to bear in mind that the epiglottis is attached anteriorly, or that the arytenoids are in the posterior portion of the organ, or that in one sitting facing the observer, the right vocal cord is on the left of the one making the examination. The relative position of the parts is well illustrated in Fig. 15. It should be borne in mind that a diagram, as in the woodcut, necessarily represents the parts in an apparently vertical plane ; hence in the figure the image is reversed, whereas the relative position of the parts in the actual examination is something more on a horizontal plane.

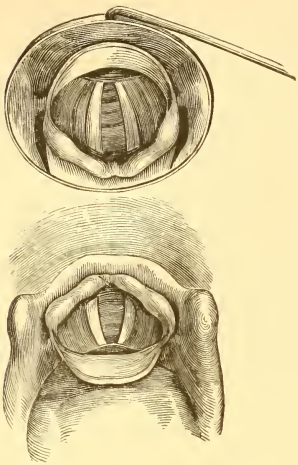

Fig. 15—Relative position of the larynx and the image in the mirror. (Cohen.)

Having brought the larynx into view, the first object that will be noticed is the epiglottis standing up prominently in the upper portion of the mirror. It is of a pinkish yellow color, the cartilage showing through the mucous membrane in some parts more distinctly than in others ; its crest or upper border is of a somewhat crescentic shape, more or less curved upon itself, and presenting a great variety of shapes in different individuals (See Figs. 16–21), and is seen in varying positions, from a fully erect one, to one in which it overhangs and almost conceals the laryngeal cavity. If the anterior or lingual surface of the epiglottis is brought into view, there will be noticed three folds of membrane passing from the epiglottis to the base of the tongue, one in the median line and one on either side, dividing the depression, between the epiglottis and the base of the tongue, into two fossæ, the lingual fossæ, or glosso-epiglottic fossæ. These fossæ occasionally afford lodgment for particles of food and other substances, and should always be examined in searching for foreign bodies in the throat.

On the posterior or laryngeal face of the epiglottis, about its centre, there will be seen a rounded pad-like prominence of a deep red color, called the cushion of the epiglottis. This is composed of a collection of acinous glands, and is said to

FIG. 16.—Arched epiglottis. (Cohen.)

FIG. 17.—Indented epiglottis. (Cohen.)

FIG. 18.—Asymmetrical epiglottis. (Cohen.)

FIG. 19.—Overhanging epiglottis. (Cohen.)

FIG. 20.—Omega-shaped epiglottis. (Cohen.)

FIG. 21.—Pointed and depressed epiglottis. (Cohen.)

Fig. 16 represents the average normal appearance of the epiglottis, broad and crescentic in outline. Fig. 17 is of much the same general shape with the upper border somewhat indented. Fig. 18 shows a departure from the ordinary shape, perfectly consistent with health, in which one side appears cut off. Fig. 19 is much the same as Fig. 16, but in a position overhanging the laryngeal cavity, thus showing more of its anterior surface. Fig. 20 shows the cartilage markedly curved upon itself, the two edges being crowded together as it were. Fig. 21 shows a pointed and overhanging epiglottis, such as is usually seen in children.

serve in a manner as a cushion for the epiglottis when it closes down upon the larynx.

There will next be noticed two folds of membrane passing downward and backward, one from each side of the epiglottis, to the arytenoid cartilages, two small, rounded, knob-like prominences in the lower part of the image which are seen moving from a state of close approximation to one of wide separation in the acts of respiration and phonation. These folds of membrane are the aryteno-epiglottic folds, or, as they are usually called, the ary-epiglottic folds, and form the lateral walls of the laryngeal cavity, separating it on either side from the pyriform sinuses. At the commencement of the lower third of each fold will be noticed a small knob-like projection which is formed by the cartilage of Wrisberg, and farther down the cartilage of Santorini, which, lying upon the arytenoid cartilage, simply serves to render it slightly more prominent, and as a rule cannot be distinguished from it. Passing from one arytenoid to the other, and showing a slight depression or notch between them, especially noticeable when they are in approximation, will be seen a fold of membrane, the arytenoid com-

missure, which completes the circuit of the lumen of the larynx, as follows: the epiglottis in front, the ary-epiglottic folds, showing the cartilages of Wrisberg and Santorini, forming the lateral wall, and the arytenoid cartilages and commissure posteriorly. Immediately behind the commissure will be noticed a closed fissure between it and the wall of the pharynx, which is the orifice of the œsophagus. Going back now to the ary-epiglottic fold, there will be noticed on the outer side of each a somewhat pyramidal-shaped cavity, the pyriform sinuses. These are bounded by the thyroid cartilages externally, the ary-epiglottic folds internally, and the pharyngeal wall posteriorly, where they approximate one to the other, and pass down into the œsophagus, behind the arytenoids. At the bottom of each sinus may be seen the superior cornua of the hyoid bone. These cavities form exceedingly favorable sites for the lodgment of fish-bones, particles of food, or other substances, and should always be carefully searched in looking for foreign bodies.

Coming now to the interior of the larynx; passing from above downward, the first objects noticed are the two false cords, more properly called the ventricular bands. These are two folds of membrane, one on either side, passing from the receding angle of the thyroid cartilage anteriorly, where they are nearly in apposition, to the arytenoid cartilages posteriorly. They are of a rather deeper red color than the other portion of the laryngeal cavity; they move with the arytenoids, and are parallel with the vocal cords, being separated from them by the openings of the ventricles of the larynx, which lie immediately below them and can be but imperfectly seen. The true vocal cords are next seen, two white glistening bands moving back and forth with the acts of phonation and respiration. Their color is due to the fibrous tissue of which they are composed, showing through the mucous membrane which covers them, and which is extremely thin, and endowed with a very sparse network of blood-vessels. During the acts of inspiration the cords are widely separated, and a view is obtained of the parts below. The position of the mirror being, as a rule, behind the axis of the trachea, it is the anterior wall that is seen, showing its rings surmounted by the cricoid cartilage. In very favorable cases a view of the bifurcation of the trachea may be obtained.

The general appearances of the healthy larynx with the coloration of the healthy mucous membrane require no lengthy description. It may be determined by the same tests to which any mucous membrane is subjected which can be seen by direct ocular inspection. In general it may be said that the lining membrane of the larynx is of a rose-pink color, with a tendency to yellow, especially where the cartilages are seen through on the surface, as at the crest of the epiglottis and on its sides, the eminences made by the cartilages of Wrisberg and Santorini, the inner wall of the trachea where the rings are manifest, etc. In all these places the membrane is of a light yellowish pink

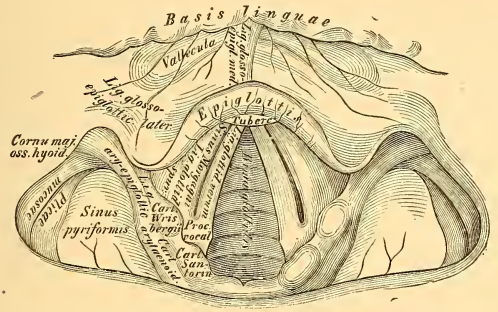

FIG. 22.—The laryngoscopic image, double size, the glottis being open as during inspiration. (Heitzmann.)

color. Again, where the membrane covers a mass of glands, or adipose, or loose connective tissue, it is of a deeper red color. This is shown in the cushion of the epiglottis, the ary-epiglottic folds, the arytenoid commissure, and the ventricular bands.

A reference to Fig. 10 will show the relative position of the parts with the names attached; the rima-glottidis being open, and the cords being in the position which they assume during the act of inspiration. Fig. 11 shows a smaller view of the laryngoscopic image, the cords being approximated for phonation. In the absence of a larynx from the cadaver or a good model, it will be found not a bad plan to use this figure for examination with the mirror. The book being held with the

upper border of the plate toward the observer, but in such a manner that it cannot be seen by direct vision, place the laryngeal mirror in such a position as will give a reflected view of it; it will afford a fair idea of the part seen in making an observation in the living subject.

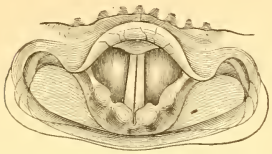

FIG. 23.—The laryngoscopic image, the glottis being closed as during phonation. (Ziemssen.)

In making an examination the first thing to notice is the general appearance of the mucous membrane. Is it discolored in any way, or does it show evidences of any of the forms of inflammatory troubles? Then notice the conformation of the larynx, the existence of growths or tumors, or is there loss of tissue from ulcerative or any destructive process; and, finally, as to movement, notice if there may be any deviation in the normal movement of phonation or respiration; are the cords approximated in the median line perfectly, and do they show a perfectly straight edge; are they properly abducted, and are the movements perfectly symmetrical?

EXAMINATION OF THE PHARYNX.

It would seem as though this were so simple a manipulation as to require no especial directions, yet oftentimes a beginner attempting to examine an obstinate patient will meet with difficulties which might easily be overcome by following very simple directions.

This examination is generally made without the aid of anything more than ordinary direct light, a lamp being held before the mouth, or the patient being directed to stand with his face to the window. Whether daylight or artificial light is used, I regard the reflecting mirror of the greatest importance, and indeed am accustomed to carry one in my pocket at all times, and make almost invariable use of it in examining the pharynx. It condenses so strong a light upon the parts, with nothing to intervene and obstruct the direct inspection, as is the case when a candle is used, or daylight in the ordinary method, that it is a very simple and easy matter to search the whole fauces, and be thoroughly satisfied as to the existence or non-existence of

morbid conditions which otherwise might easily escape notice; such as small diphtheritic or croupous deposits, enlarged or inflamed follicles, mucous patches, etc.

Many persons can easily depress their own tongues in so

Fig. 24.—Tuerck's tongue spatula.

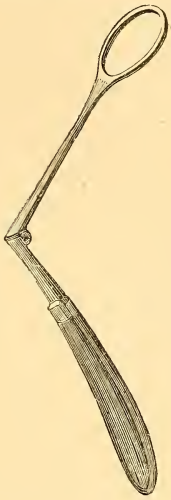

Fig. 25.—Pocket folding spatula.

Fig. 26.—U. S. A. spatula.[1]

satisfactory a manner as to afford a complete view of the fauces, but in a majority of cases a tongue depressor or spatula will be necessary. Fig. 24 represents what is generally known as Tuerck's spatula. It is an excellent instrument and can easily be held by the patient himself; although, unless he has had

some training, the physician will be compelled to introduce the instrument. Fig. 25 shows a much simpler instrument, an ordinary pocket folding spatula, which answers an excellent purpose.

There is no better instrument devised than the ordinary U. S. army spatula, Fig. 26; this, however, is a somewhat rudely made instrument. Sass's spatula, shown in Fig. 27, is constructed on the same principle.

Fig. 28 illustrates in much reduced size a very simple spatula, suggested by Dr. Sexton, equally adapted for the tongue

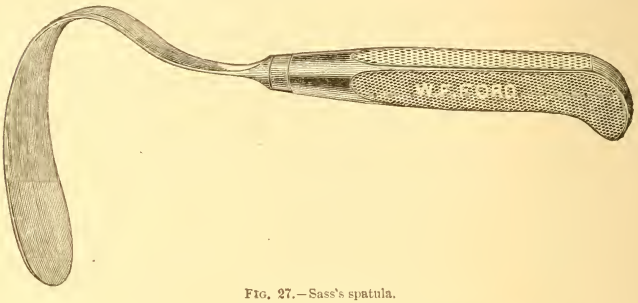

FIG. 27.—Sass's spatula.

FIG. 28.—Sexton's spatula.

and the cheeks when it is desired to explore the mucous membrane of the oral cavity.

In introducing the tongue depressor, its beak should always be carried beyond the arch of the tongue, that is, beyond the highest point to which the tongue is visible, otherwise in pressing it downward its anterior end only will be depressed, while its centre will arch up and interfere with the inspection. This may seem a very simple and even unnecessary direction, but I have had to repeat it so often to my students, many of them physicians of long practice, that it will not seem out of place to repeat it here. The beak of the spatula should be carried just far enough to cover the arch of the tongue and no farther,

otherwise its pressure on the sensitive parts near the base of the tongue will be liable to excite retching or vomiting.

The spatula should be held between the thumb and forefinger, the thumb pressing against the angle while the second finger passes under the chin; in this manner a grasp is obtained of the lower jaw, and control of the movement of the head secured. Then the tongue should be pressed, not downward, but downward and forward, by a rotary movement of

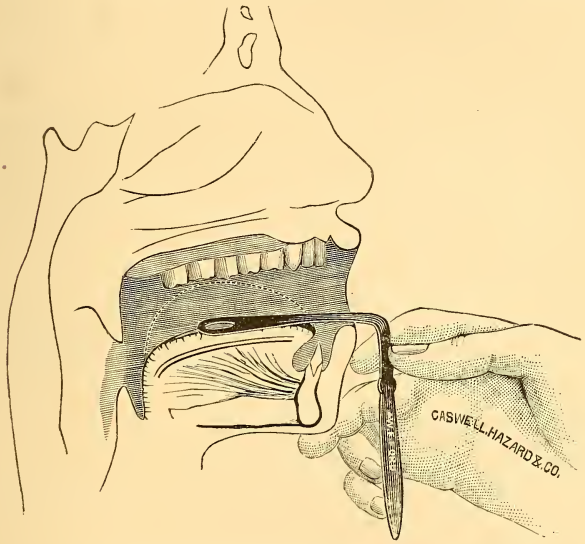

FIG. 29.—Method of introducing the spatula and depressing the tongue.

the spatula, the beak of the instrument being made to revolve in the arc of a circle which has its centre at the teeth. If this movement is made with a slow but firm pressure, the whole fauces will be brought into view, and in a small proportion of cases the epiglottis even, will be seen rising up at the base of the tongue. If retching occurs, however, before the inspection is accomplished, the attempt should immediately be abandoned for the time, and a few moments of rest given. In all cases a view should be gained of the parts fully at rest, as the

instant retching occurs the contraction of the palato-glossus and palato-pharyngeus muscles forces the tonsils so far into the median line as to prevent the observer forming any estimate as to the true condition ; and also so far masks the pharyngeal wall as to prevent its proper inspection ; the palate and uvula are also elevated to such an extent that their surface can not be properly examined. A reference to Fig. 29 will show the position of the spatula, the method of grasping it, the movement by which the tongue is depressed, and the direction which it takes. The parts seen on pharyngeal examination need no explanation ; they comprise simply the pillars of the fauces, with the tonsils lying between, the uvula and soft palate, and the pharyngeal wall.

The examination in the main is to determine the existence of croupous or diphtheritic deposits, any of the varieties of catarrhal inflammation, or follicular engorgement, the existence of mucous patches, ulceration, enlargement of the tonsils, elongation of the uvula, the existence of tumors or any morbid growths, paralysis of the muscles of the palate, etc.

The difficulties encountered in making an examination of the pharynx are all embraced in the one condition of excessive irritability, which can only be surmounted by patience and persistent effort on the part of both the physician and patient.

Examination of the Nasal Cavity.

This examination is made both anteriorly and posteriorly, and in order that it may be made with any degree of satisfaction, the reflecting mirror is absolutely necessary.

The examination anteriorly is made by dilating the flexible portion of the nostrils by some suitable speculum, and throwing the light in by the mirror, so held that the focus of light may fall upon the part to be examined, the tip of the nose being lifted by the thumb of the left hand. The head of the patient should be thrown well back and then brought gradually forward in order to bring into view the different parts successively. An ordinary ear speculum of large size answers the purpose very well, but it requires the use of one hand to hold it, and also simply holds the nostrils open without dilating them.

Fraenkel's speculum, shown in Fig. 30, is composed of two blades regulated by a set screw. It may be inserted in both nostrils, or one, at pleasure, and serves to dilate the opening. It is also self-retaining to an extent. Goodwillie's speculum, Fig. 31,

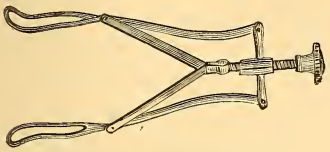

FIG. 30.—Fraenkel's nasal speculum.

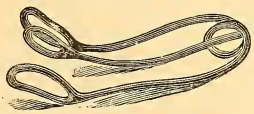

FIG. 31.—Goodwillie's nasal speculum.

a much simpler and cheaper instrument than Fraenkel's, has three blades, which spread by their own elasticity and answer quite as good a purpose. An ordinary hair-pin, with a half inch of the bowed end bent at right angles, makes a most excellent speculum, and is within reach of every one. The method of using it is shown in Fig. 32.

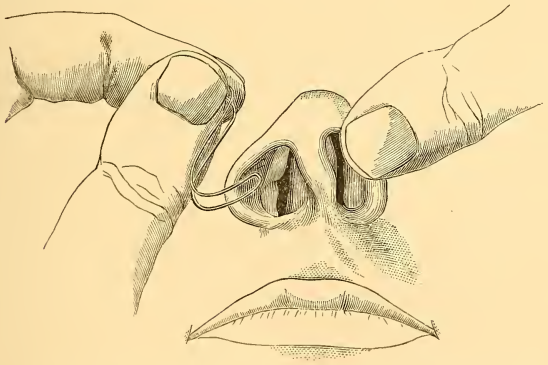

FIG. 32.—Examination of nasal cavity anteriorly, by means of a bent hair-pin. (Cohen.)

Fig. 33 shows a simple nasal speculum which I have had constructed for my own use, and which is more perfectly self-sustaining than any other within my knowledge. It is simple and inexpensive.

Fig. 34 illustrates Simrock's speculum. This is an excellent instrument, and especially adapted for use in making caustic

applications, where it is necessary to protect the nostril from accidental contact with the agent used.

Elsberg's trivalve nasal speculum is shown in Fig. 35, and is a very efficient instrument.

It should be remembered in regard to the use of the nasal speculum that it is in no wise designed to separate the cartilaginous alæ of the nose, but merely to distend the flexible portion of the nostril, hence it should never be introduced beyond that portion of the nose.

The parts seen.—With the head bent forward, and the tip of the nose lifted, there will be brought under inspection a considerable portion of the floor of the nares, with the anterior

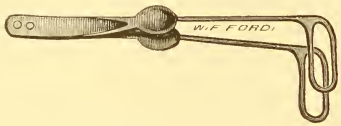

FIG. 33.—The author's nasal speculum.

FIG. 34.—Simrock's nasal speculum.

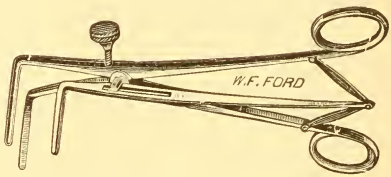

FIG. 35.—Elsberg's nasal speculum.

termination of the inferior turbinated bone, a pale red rounded protuberance, projecting from the outer wall of the cavity; also the wall of the septum for a considerable distance. Occasionally, if the cavity is wide and a strong light is used, there can be seen, through the fissure between the turbinated bone and the septum, the wall of the pharynx. As the head is thrown backward there is brought into view the under surface and anterior termination of the middle turbinated bone, lying apparently somewhat behind the inferior bone; and finally, a small portion of the roof of the nares, with the whole anterior nasal cavity, and the remaining portion of the septum as high as the superior turbinated bone. If the examination is in any way interfered with by the hairs which lie in the nostril, they can of course easily be removed by the scissors.

The anterior examination reveals the condition of the mucous membrane of the nose, as far as seen, as to the character and degree of inflammation existing; the amount and character of its secretion; the existence of ulceration and necrosis; the degree to which the passage is pervious; the position of the septum as regards its deviation from the median line; and finally, the existence of any neoplasm in the cavity, by far the most frequent of these being mucous polypi.

It is especially urged in this connection, that, whenever it is possible, sunlight should be used in preference to the artificial light. By this means it will often be feasible to explore the whole nasal cavity from in front, and even bring into view the wall of the pharynx.

The examination posteriorly is made by so placing the small laryngeal mirror in the back part of the fauces that it will give a reflected view of the parts above and out of the line of direct vision. The patient should be placed in the same position as that required for examination of the larynx, and the light thrown into the open mouth in such a manner that the rays are brought to a focus at or near the wall of the pharynx.

The next step is so to depress the tongue that ample space will be afforded between its base and the free border of the soft palate for the passage of the mirror without its touching the parts. For depressing the tongue the same remarks apply as were made in reference to the examination of the pharynx. In order to obtain a successful observation it is absolutely necessary that the throat should be completely relaxed, and especially that the palate should be entirely at rest and hang free from the pharynx, as it is through the opening between these parts that the view is obtained. If the mirror on its introduction touches the uvula, soft palate, or the root of the tongue, it is extremely liable to cause so much irritation, for these parts are very sensitive in most patients, that contraction of the faucial muscles will occur, and the palato-pharyngeal opening be completely closed, and of course the examination prevented.

Having then the tongue thoroughly depressed, while at the same time the faucial muscles are completely relaxed, it will be seen that there is a wide space afforded behind the soft palate and uvula for the introduction of the mirror. It may be here

remarked that until this space is seen to be open, and the parts are entirely relaxed, the attempt should never be made to pass the mirror, but the patient should be subjected to such training as will enable the observer to depress the tongue without exciting those muscular contractions which shut off the palato-pharyngeal opening. As a rule, this may be easily accomplished by the exercise of a little patience for a few moments.

The next step is to introduce the mirror. This should be held lightly in the hand (See Fig. 36), and passed back some-

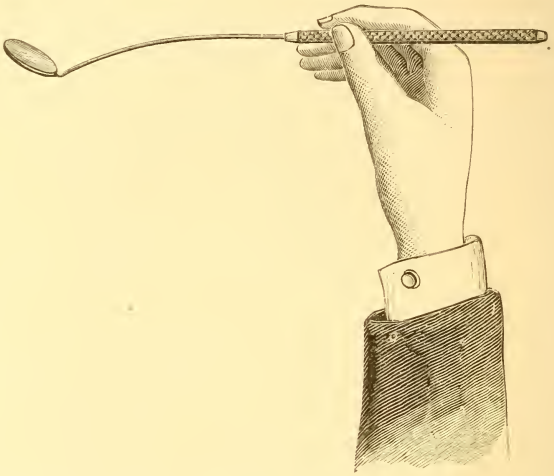

FIG. 36.—Holding the mirror for the rhinoscopic examination. The angle between the mirror and the shaft is such as is adapted for examining the vault of the pharynx. (Browne.)

what edgewise in order that it may pass through the notch between the uvula and right pillar of the fauces, if the mirror is held in the right hand, in such a manner that it may not touch the parts, there not being, as a rule, sufficient room for it to pass under the uvula. Then by twisting the handle from left to right between the fingers, the reflecting surface should be brought around so that it will receive the rays of light in a direct line, and the mirror carried upward until its upper border is slightly hidden by the soft palate.

If the patient is directed to sound, with as full a nasal twang

as he can give it, "*eh*," it will aid very much the success of the manipulation, for thereby the palate is lowered and the palato-pharyngeal space thrown widely open.

The position of the mirror should be at a right angle with the line of vision, and nearly in a vertical plane; the handle being held at one side as in laryngoscopy, with the shaft lying against the corner of the mouth. A reference to Fig. 37 will

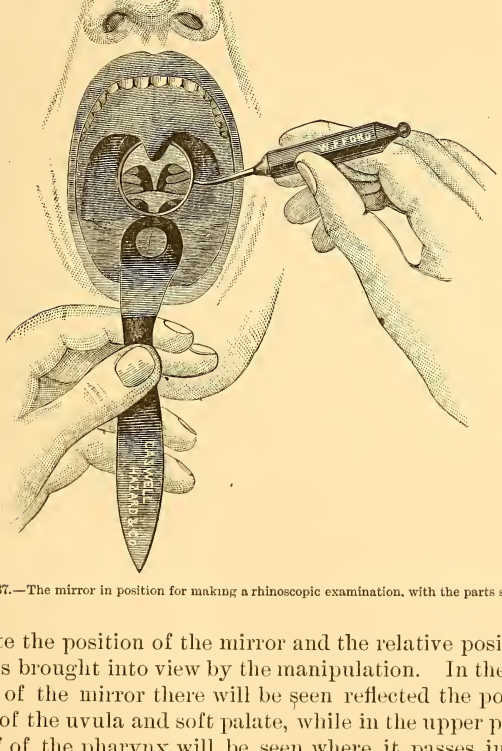

Fig. 37.—The mirror in position for making a rhinoscopic examination, with the parts seen.

illustrate the position of the mirror and the relative position of the parts brought into view by the manipulation. In the lower portion of the mirror there will be seen reflected the posterior surface of the uvula and soft palate, while in the upper portion, the roof of the pharynx will be seen where it passes into the nasal fossæ. Beyond these, and in the dim background, as it were, there will be brought under inspection a somewhat fore-

shortened image of the nasal fossæ, with the turbinated bones, the septum, and the orifices of the Eustachian tubes.

As a rule, a smaller mirror is used in rhinoscopy than in laryngoscopy, a No. 2 or 3 being the usual size. It should also be bent at a sharper angle with the shaft, the angle being about 100°—110°.

Obstacles to Rhinoscopy.—The main obstacle to the examination is an irritable throat, as in laryngoscopy, with the only difference that it is less easily surmounted. For its management the same remark may be made as was made concerning the laryngeal examination; the greatest patience must be exercised in teaching the patient to relax his throat, and allow of the introduction of the mirror without gagging. As a rule, this is only accomplished by the persistent, but patient, slow and gentle introduction of the spatula and mirror, carrying the

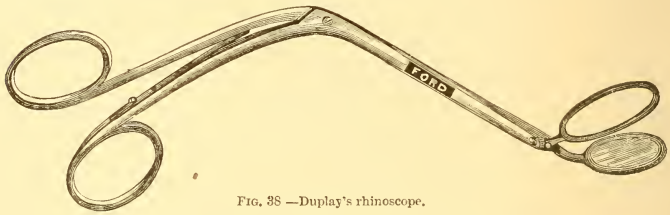

Fig. 38.—Duplay's rhinoscope.

operation to the point of tolerance, but arresting it always before retching is excited.

An obstinate tongue which arches itself up in the mouth, and cuts off the view, often accompanies an over-sensitive throat, and is overcome by a similar exercise of patience.

Enlarged tonsils, if sufficient to interfere with an inspection, should be removed.

A narrow palato-pharyngeal space is sometimes a troublesome obstacle in rhinoscopy, as it affords but scant room for the examination. In order to overcome this difficulty, various hooks, dilators, and retractors have been devised. A simple rounded hook may be passed around the palate for drawing it forward, but it requires the use of one hand, and is also not usually well tolerated by the patient. Fig. 38 represents Duplay's rhinoscope, which is designed to overcome this difficulty somewhat. None of these devices, however, are of much service, as the palate is so sensitive that even when an exami-

nation may be easily submitted to, the impact of instruments of this kind is not tolerated. For the examination alone a little training of the patient will usually enable the observer to accomplish all that he desires. Where it becomes necessary to make a more careful examination, or where the success of an application or operation requires the absolute control of the palate, or a wider patency of the palato-pharyngeal space, the resort can always be had to the method of tying the palate suggested by Dr. Wales of the United States Navy. This procedure consists in passing a cord through each nostril to the pharynx, and drawing it out through the mouth, when it is passed over the ear on each side and tied behind the head. By this means a gentle traction can be exercised on the palate, under which it gradually yields, and is finally folded on itself, as it were, and a broad space afforded for reaching the parts above for manipulation or operation. This device of Dr. Wales is very simple, easily accomplished, and well tolerated by the patient, and should always be resorted to in any case in which it will add to the completeness of the diagnosis or promote success in operating.

The passing of the cords through the nares may be done by the Bellocq canula (Fig. 107), but the objection to this instrument is, that it is so large that it may cause unnecessary pain, and also troublesome hemorrhage.

Dr. Duncan recommends the use of a small, flexible male catheter, with the stylet in place, for passing the cords ; and it is an excellent and useful device. By slipping a cord under the stylet, through the fenestrum at the end of the catheter, it can easily be carried to the pharynx, when by withdrawing the wire the cord is released, and being seized by a long pair of forceps it can be drawn out through the mouth, while the catheter is withdrawn from the nose.

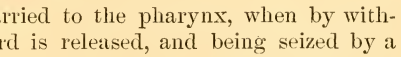

Fig. 39.—The author's canula for passing a cord through the nares.

I have had constructed a serviceable little instrument, shown in Fig. 39, for the purpose of passing the cord through the nares, suggested by the Bellocq canula.

An ordinary Eustachian catheter of hard rubber is shortened to about four inches, and bent to adapt it somewhat to the floor of the nares, as shown in the figure. This little canula can be passed easily and painlessly through the nares, and

when in position lies upon the floor of the cavity, with its curved extremity slightly projecting over the soft palate and directed downward into the pharynx, while the expanded portion protrudes slightly from the nostril. A stiff piece of linen cord is now passed through the canula until it emerges into the pharynx, when it is easily seized with a pair of forceps and drawn out through the mouth, while at the same time the canula is withdrawn from the nostril. The cord is then tied in front of the lip and the same procedure repeated for the other nostril. The ordinary surgeon's knot of three turns should be used in tying the cords, as in this manner they can be quickly and easily released or drawn up as may be desired. I usually keep a supply on hand of cord which has been immersed slightly in mucilage and allowed to dry, as this gives it a firmness and stiffness which renders its passage through the tube very much easier. Catgut answers a most excellent purpose in place of the linen cord, in that, when moistened with the mucus of the parts, it is less irritating than the linen is liable to be.

When the cord is drawn out through the mouth it should be tied as quickly as possible, as the tension on the palate is far better tolerated than the loose cord dangling in the fauces. This plan of tying the palate is quite easy of accomplishment, is very well borne by the patient, is not usually attended with any difficulties, and should always be resorted to when it will add in any way to the completeness of a diagnosis. In operating or making the stronger applications to the upper pharynx it becomes almost an indispensable aid.

A long uvula not unfrequently proves an obstacle in making a rhinoscopic examination. It may be raised by means of a hook or pincette; or, better still, it may be caught in an elastic slip-noose and drawn forward. This latter plan will be well tolerated, and occasionally serves a good purpose, in place of tying the palate by means of Wales's method, to obtain access to the posterior nasal and pharyngeal regions for examination and the simpler operations.

The Rhinoscopic Image.—The mirror being placed in the position described, there will be brought into view the oval-shaped openings of the posterior nares, Fig. 40. Separating them in the median line there will be seen, the septum, broad above and tapering to a sharp and narrow edge below. On each side of the septum will be seen, as dark cavities, the nasal passages

and projecting into them, from the outer wall of each, the turbinated bones. The superior turbinated bone will be just visible, a light reddish band, in the upper part of the image, emerging as it were from the shadow, and seeming to slant upward and forward. Immediately below it, and separated from it in the posterior portion by a dark line, the superior meatus, will be seen the middle turbinated bone, appearing as an elongated and somewhat fusiform projection, of a yellowish red color. Below this again may be seen a considerable portion of the middle meatus, and below this the upper half of the inferior turbinated bone, of much the same color as the middle bone, and giving the impression of a somewhat elongated mass resting on the floor of the nares. The inferior meatus and floor of the nares cannot be brought into view. If now the mirror be turned somewhat to one side, there will be seen the eminence surrounding the orifice of the Eustachian tube, separated from the lateral wall of the vault of the pharynx by the sinus of Rosenmüller. The Eustachian tube being seen in profile, the orifice simply shows a dark line on a bright yellow background, which is the anterior wall of the depression leading into it.

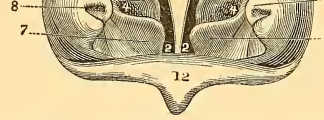

FIG. 40.—The rhinoscopic image: 1, vomer, or nasal septum; 2, nasal passages; 3, superior meatus; 4, middle meatus; 5, superior turbinated bone; 6, middle turbinated bone; 7, inferior turbinated bone; 8, pharyngeal orifice of Eustachian tube; 9, upper portion of fossa of Rosenmüller; 11, glandular tissue at the vault of the pharynx; 12, posterior surface of the palate and uvula. (Cohen.)

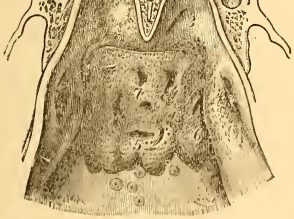

FIG. 41.—The glandular structure of the vault of the pharynx—natural size (Luschka): 1—1, pterygoid processes; 2, vomer; 3—3, posterior portion of the nasal fossæ; 4, Eustachian tube; 5, bursa pharyngea; 6, fossa of Rosenmüller; 7, irregular surface of the glandular tissue. (Luschka.)

By changing the inclination of the mirror now to a more obtuse angle (See Fig. 36), there will be brought into view the dome-like cavity of the vault of the pharynx, presenting a somewhat irregular outline, the surface being marked by furrows and depressions which indicate the site of the pharyngeal

tonsil (See Fig. 41); the parts becoming smoother as the view passes down, until there is seen the deep red, smooth, shining surface of the mucous membrane of the lower pharynx. This change in the inclination of the mirror is best accomplished by simply turning the handle in the fingers, as the attempt to accomplish it by elevating or depressing the hand is liable to end in causing retching. To obtain a complete inspection of the vault of the pharynx, it will generally be found best to change the mirror and use one mounted at an angle of 130°, the same used in making a laryngeal examination.

This examination reveals the condition of the mucous membrane of the nasal cavity; the variety and extent of the hypertrophic thickening which characterizes nasal catarrh; the condition of the pharyngeal tonsil; the extent of hypertrophy that may exist there; the character and amount of the secretions from the parts; the existence of tumors in the nose, or vault; ulceration; necrosis, etc.

CHAPTER II.

MUCOUS MEMBRANES.*

Before entering upon the consideration of special diseases, a better comprehension of them will be obtained by devoting a separate chapter to the subject of mucous membranes in general.

Anatomy.

A mucous membrane in its construction closely resembles the skin, of which it may be considered a modification; the one being the covering membrane of the external surface of the body, while the other forms the lining membrane of such internal cavities and passages as communicate with the external world: these are the intestinal canal, the lungs and air-passages, and the genito-urinary tract; the membrane as found in these parts presenting the same general type. It is generally described as composed of two layers, a basement membrane and an epithelial coat; but beneath the basement membrane there is found a cellular tissue which plays so important a part in its pathology that it may be properly considered a third layer. There are then: *First*, a non-vascular layer composed of epithelial cells. *Second*, the mucous membrane proper, a layer composed of fibres of connective and elastic tissue embracing within their meshes, blood-vessels,

* This chapter on mucous membranes was prepared, in the main, for an introductory lecture in my course at the Bellevue Hospital Medical College several years ago. I insert it here with few changes, believing that a clearer understanding of the diseases of the upper air-passages will hereby be attained by such as may not be already familiar with the subject of the chapter. I, of course, pretend to no original research on the subject, as the bulk of what I have written is compiled. For much of the subject I am indebted to Dr. Green's admirable work on "Pathology and Morbid Anatomy." I prefer to acknowledge my indebtedness in this foot-note rather than mar the text by the numerous quotation-marks which would be necessary were I to resort to their use.

smooth muscular fibres, different forms of small glands, and presenting minute processes or villi. *Third*, an external layer of loose connective tissue; the submucous cellular tissue. (See Fig. 42.)

First—The epithelial layer.—An epithelial cell, the typical or elemental gland, is simply a soft rounded cell, containing a nucleus and cell contents, pellucid or granular, and all con-

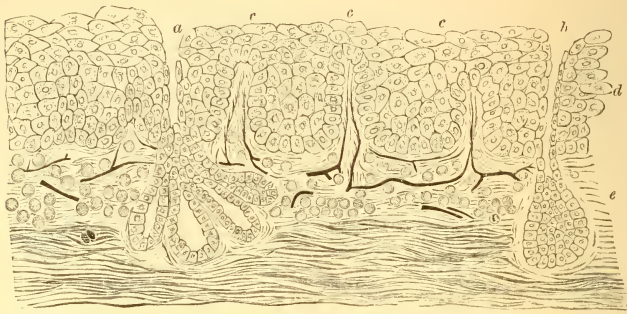

FIG. 42.—Vertical section of a mucous membrane (Luschka): *a*, compound or racemose gland; *b*, simple follicle; *c*, villi, containing a network of blood-vessels or a single loop, with nerve-filaments; *d*, epithelial layer; *e*, mucous membrane proper containing blood-vessels, nerves, muscular fibres, and rounded and closed follicles; *f*, submucous connective, or areolar tissue.

tained in a cell-wall whose varying shape gives to it its name; such as:

1. *Pavement* or *tesselated* epithelium, so called from their being pressed down and flattened from above, and crowded together in such a manner as to give an angular outline to each cell. (Fig. 43.)

2. *Columnar epithelium.*—Elongated cells with rounded or square ends. (Fig. 43.)

3. *Columnar ciliated epithelium.*—The same shaped cell as the columnar, but endowed with fine hair-like processes on the free end, which possess the power of vibratory motion. (Fig. 43.)

4. *Squamous epithelium.*—Worn out or dried cells which are thrown off from the surface.

These cells may be arranged in a single layer or in several layers, one above the other; this latter arrangement is generally found in mucous membranes in two varieties.

a. The laminated pavement.—Commencing with the elonga-

ted or columnar cells beneath, and becoming rounded above until they reach the surface where they become of the pavement variety. This arrangement is found in the lower portion of the pharynx, and in the œsophagus.

b. The laminated ciliary.—Commencing with rounded cells below, which, becoming elongated as they approach the surface, show on the upper layer the columnar ciliated cells. This variety is found in the lungs and air-passages, except the smaller bronchi.

Second—The mucous membrane proper.—Beneath the epithelial cells is found the mucous membrane proper; composed, as stated, of connective tissue, elastic tissue, muscular fibres,

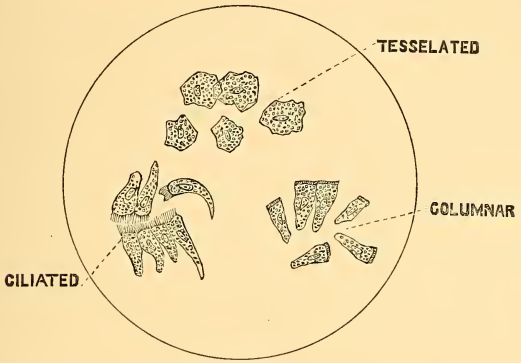

FIG. 43.—Epithelial cells.

glands, blood-vessels, and nerves, and marked by minute processes or villi.

The connective tissue which is found in this layer is composed of fine fibrils united into bundles by a small quantity of a clear connecting substance, and forms a close network, or an almost homogeneous membrane. In this connective tissue we find certain cells, resembling the white corpuscles of the blood, the so-called leucocytes. This is the connective-tissue corpuscle, or, as it is sometimes called, the migrating corpuscle, and again the amœboid cell, from its observed power of motion. This cell performs an important part in inflammations, not only of mucous membranes but of other tissues, as will be noticed farther on.

The elastic tissue, one of the elementary structures of the body, is displayed more or less freely throughout this layer, and is composed of simple thread-like fibrils, crossing and interlacing in every direction. It is of a yellow color and possesses a high degree of elasticity.

The muscular fibres are of the unstriated variety, and are very sparsely distributed through the layer.

The glands are of two varieties, the simple follicle and the compound follicle or racemose gland. The simple follicle is merely an infolding of the membrane into a straight tube or flask-like cavity. The racemose gland is composed of a cluster of flask-like follicles, opening into a single duct, whose orifice is upon the surface of the membrane.

The vessels are very numerous and form close meshes in the membrane proper, sending a loop into the smaller villi, and into the larger, a close network.

Third—The submucous cellular tissue.—This is composed of a more or less loosely connected network of connective tissue, by which the mucous membrane is attached to the parts beneath, and of course allows of a very free play between the membrane and these parts. This fact becomes of extreme importance in connection with acute inflammatory affections of the membrane, as it admits of the effusion of serum into this layer, where its attachment is very loose, as in the ary-epiglottic folds of the larynx, the posterior surface of the epiglottis, and the ventricular bands.

Physiology.

The function of mucous membranes is to afford a soft, moist, and pliable lining, to those cavities and passages of the body, which communicate with the external world. It is lubricated by a clear fluid mucus, which is poured upon it by the follicular and racemose glands, whose ducts open upon its surface ; and also by the epithelial cells which compose its superficial layer, each epithelial cell being in its small way an independent and secreting gland.

Growth.—Owing to the constant mechanical disturbance to which the membrane is subjected in mastication, speaking, etc., the cells of its superficial layer are being constantly detached

and thrown off. In order to compensate for this loss, new cells are being continuously generated from below. The method by which this is accomplished is exceedingly simple, and may be explained by a very brief reference to cell pathology. Virchow first advocated the doctrine some twenty years ago which now meets with general acceptance, that every cell grows from a parent cell; and in no department of histological study is the observation more clearly confirmed than in that of mucous membranes. The method of cell-development is probably by one of three processes:

1. *Division.*—A constriction develops across the centre of a cell, which becoming narrower and of an hour-glass shape finally separates, and in place of one cell two cells exist.

2. *Gemmation.*—In this process there appears at some point in the cell-wall a small projection which protrudes more and more, while its attachment to the parent cell becomes narrower, and finally, it drops off a newly developed cell.

3. *Endogenous growth.*—A new cell is developed inside the parent cell, as the fœtus in the mother's womb; and finally, when it has attained maturity, it bursts its wall and escapes.

It is by one of these processes that new cells are being constantly generated in the deeper layer of the epithelial coat of the membrane, to make good the waste which is constantly going on at its surface.

Another physiological characteristic of mucous membranes is their permeability, by which fluids may penetrate them from without, and become absorbed by the blood-vessels, or perceived by the nerves. The activity of this function depends mainly on the thickness of the epithelial coat, and where this is very thin, as over the papillæ of the lips, and the tip of the tongue, we find this sensitiveness very acute.

An exception to this rule is found in the fact that the virus of the snake does not permeate mucous membranes, and is in no way absorbed by them, it being necessary that it should meet with an abraded or cut surface, in order to reach the blood-vessels and be taken up by them. The same is true of the syphilitic virus, which is only inoculable through an abrasion of the membrane.

Inflammation of Mucous Membranes.

Inflammation is that series of changes which takes place in any tissue as the result of an injury, provided the injury is not of such a character as to completely destroy its vitality. This injury may be a direct irritation of the tissue by a mechanical or chemical agent, or by substances carried to it by the blood, or it may be an indirect irritation, as is the case in inflammation of internal organs, as the result of exposure to cold.

Through the researches and experiments of Cohnheim, Stricker, Burdon-Sanderson, and others, the nature of these changes is well known. The process comprises:

1. Changes in the blood-vessels and circulation.
2. Exudation of liquor sanguinis and migration of white blood-corpuscles.
3. Alteration in the nutrition of the inflamed tissues.

1. The first effect of an irritation of the tissues is to cause dilatation of the arteries, followed soon by dilatation of the veins. This dilatation is also attended by an increase in the length of the vessels, and they become more or less tortuous.

The enlargement of the vessels is attended at the outset of the process with an acceleration in the flow of blood, but this is soon followed by a retardation of the flow, the vessels remaining dilated. As the circulation becomes slower, the white corpuscles, or leucocytes, accumulate in the veins, and their natural tendency to adhere to the sides of the vessels is increased to such an extent that they nearly fill the calibre of the tube, and accumulate against its walls, remaining almost stationary while the blood-current passes by them, though with a greatly diminished velocity. Those immediately in contact with the wall of the vessel are now seen to press against it, and finally to pass through into the tissues beyond, simply transuding the wall, the opening closing up behind them.

2. Associated with the passage of the blood-corpuscles is the exudation of liquor sanguinis. This exudation, which constitutes the well-known inflammatory effusion, differs from the effusion which escapes from the blood-vessels in simple mechanical obstruction, as in dropsy from heart disease, or cirrhosis,

in containing an amount of fibrin and albumen, varying with the extent and severity of the inflammatory process.

3. The remaining constituent of inflammation is the alteration in the nutrition of the inflamed tissue. The cells which constitute a normal part of the tissue take on an increased activity; the normal processes of physiological growth become greatly exaggerated, and new cells are developed by one of the methods before alluded to.

This in brief completes the picture of inflammation in general. Confining ourselves now to mucous membranes, we find certain peculiarities manifesting themselves in the processes.

Inflammation of mucous membranes occurs in three different varieties: *catarrhal*, *croupous*, and *diphtheritic*.

Catarrhal inflammation.—This is by far the form most frequently met with. In its milder degrees it is characterized merely by an increased secretion of mucus. An increased flow of blood to the parts, occurring at the outset of the process, seems to stimulate the cell-elements to an abnormal activity, in which new cells are generated; the glands pour out their normal secretion in excessive quantities; an abundant liquor sanguinis transudes the vessels; and the result is an increased secretion of mucus, which is highly charged with young cells, many of them having their source within the epithelial cells, while others are emigrant blood-corpuscles. The membrane at the same time becomes swollen and reddened as the result of the increased vascularity.

If the irritation be more severe the vascular phenomena are more marked; the cell-generation is more rapid; and as the result of this rapid generation they seem to fail of attaining maturity, and are poured out in an unripe state; hence they are smaller, and not so well developed. Many of these imperfectly developed cells cannot be distinguished from pus-corpuscles; while others are larger and resemble the mucus-corpuscle or leucocyte. Between the mucus-corpuscle and the pus-corpuscle we have no method of distinguishing, except that the former is larger and of a somewhat more regular outline. The epithelium also loosens and falls off more rapidly from the surface of the membrane, under the stimulus of the inflammatory process; and as it progresses we have the mucous discharge gradually becoming a purulent one, from being so highly charged with these unripe cell-elements, many of which are virtually pus-cells.

The process continuing, its activity, which so far has been largely confined to the superficial layer of the membrane, extends to the sub-epithelial layer, or the mucous membrane proper, which now becomes more involved, and the cell-elements here take on renewed activity, and becoming rapidly generated, they distend and infiltrate the parts. The membrane becomes thickened and more swollen ; and there now may occur several secondary manifestations of the inflammatory process. As the result of the loss of surface epithelium, the membrane may become denuded of its epithelial coat, and there may occur an abrasion or so-called catarrhal ulcer. As the result of the distention and infiltration of the membrane proper, the glands may become so choked that their contents are imprisoned, and as the result, there is formed a minute abscess, which breaking and discharging, there is left a small ulcer. The acute process may subside or it may lapse into the chronic state. In this the increased vascularity subsides to an extent, though the vessels remain permanently somewhat dilated. The cell-production, however, goes on both in the epithelial layer and in the mucous membrane proper ; and the increased secretion persists ; but all in a somewhat diminished degree.

Chronic catarrh differs from acute catarrh in that in the former the sub-epithelial layer of the membrane is much more involved. It is thickened and indurated by its infiltration with the young cells before spoken of, the mucus-corpuscles, and migrating blood-corpuscles ; and also by a renewed activity in another elemental tissue of the membrane, viz., the connective tissue, which plays an important part in chronic inflammation. This tissue is developed now by a slow process of proliferation, and by its peculiar characteristics gives rise to those features of chronic catarrh which render it extremely obstinate to manage.

Having been once developed it is probable that connective tissue is never absorbed, or excreted as the other cell-elements in catarrh ; but becoming organized, it remains a permanent element in the membrane to deform, disorganize, and interfere with its proper function. As the result then of the new deposit in the membrane, we may have its normal thickness so much increased as not only to interfere with its proper function, but also to impair by mechanical means other functions ; as in the hypertrophied membrane of the nose, causing nasal stenosis,

and thereby interfering with normal nasal breathing. Again, this tissue may be so deposited as to press upon the glands and follicles of the membrane in such a manner as to cause their atrophy, thus robbing the membrane of its proper supply of lubricating fluid, its mucus, and giving rise to the so-called *dry catarrh*. It may be deposited about the individual follicles or glands in such a manner as to press upon the outlet alone, thus closing them up, giving rise to small cysts; or their contents becoming imprisoned, undergoing fatty degeneration, and acting as a renewed source of irritation, there may occur a glandular hypertrophy of an individual follicle or gland, giving rise to the so-called follicular inflammation.

Croupous inflammation.—This form of inflammation is of a higher grade and of a more intense form than the catarrhal; for while it commences in the same manner, with distention of the blood-vessels, escape of liquor sanguinis and blood-corpuscles, and proliferation of cells, it differs from it in the fact that the exuded liquor sanguinis contains a large amount of fibrine and albumen, which coagulates upon the surface of the membrane, and forms a false membrane. This false membrane is of a more or less dense, firm character, and is composed of fibrine enclosing a large number of epithelial cells in its meshes. At times it may be soft and almost granular in character, so much so that it may be easily removed with a soft brush, coming away in small broken particles. At other times it may be of so dense a character, that after removal it can be torn only with considerable force. As a rule it can be easily removed, leaving the membrane beneath it in the main intact, merely deprived of some of its superficial epithelial cells. After removal, the same process may be renewed and a new membrane form, or the parts may be restored to their normal condition.

The favorite site for this form of inflammation is in the upper air-passages, the pharynx, tonsils, larynx, and trachea, though it may occur in the bronchi, intestinal canal, and other parts.

Why this form of inflammation occurs it is impossible to state; but it is not improbable that it is due to some previously existing blood condition, which dominates the inflammatory process, and so enriches the exuded liquor sanguinis with the fibrinous material, that it coagulates on its exposure to the air, and so a false membrane is formed in place of the fluid

catarrhal discharge. Further evidence that this form of inflammation is due to some previous condition in the blood, is afforded by the fact that its onset and course are usually marked by a febrile movement far more aggravated in character than we would expect to find as merely symptomatic of so limited an extent of local inflammation. The temperature in simple membranous sore throat, characterized by a croupous deposit on the tonsil, often ranges as high as 103°—104°.

Croupous inflammation may manifest itself in a fibrinous exudation on the surface of a mucous membrane, as in croupous laryngitis, or true croup, membranous sore throat, croupous pharyngitis, etc. ; or the exudation may take place into the follicles of the membrane, giving rise to an acute follicular inflammation, such as occurs in the affection generally known as acute follicular tonsillitis, which is a croupous inflammation of the tonsil, in which the exudation takes place in the crypts of the organ rather than upon its surface.

Diphtheritic inflammation.—This variety of inflammation again is characterized by the formation of a false membrane, and also commences as a catarrhal inflammation, with its increased blood flow, cell-proliferation, and exudation of liquor sanguinis, the exudation, as in the croupous form, containing largely of fibrine and albumen ; but there is this difference, that while in the croupous form the exudation is poured out upon the surface of the mucous membrane, in the diphtheritic form it permeates and infiltrates its whole thickness down to the submucous tissues.

This exudation permeates the membrane so densely that in coagulating it completely destroys its vitality, and there is formed a dead membrane, involving the whole thickness of the mucous membrane. It is removed with considerable difficulty ; and in its removal, carrying with it the whole thickness of the membrane, leaves the parts beneath entirely denuded, a raw surface. The false membrane declares itself to the eye as a dead membrane ; a genuinely necrosed or sloughing tissue, of a dark grayish color, resembling boiled maccaroni; in contradistinction from a croupous membrane which is of a bluish, pearl-gray color, presenting no appearance of necrosis, but rather of an unmistakably living tissue.

It should be understood in regard to these terms, croupous and diphtheritic inflammation, that they only refer to forms

of inflammation to which mucous membranes are subject, and not to the specific diseases which are spoken of under the names croup and diphtheria; as for instance, membranous croup is generally understood to be a croupous inflammation of the mucous lining of the larynx, although a better classification would suggest the more expressive and correct name of croupous laryngitis; and also of diphtheria, it is a blood disease, characterized by a local manifestation in the throat, consisting of an acute inflammation of its mucous membrane, which assumes the diphtheritic form; so that when we speak of croupous and diphtheritic inflammation, we simply define the form which the inflammatory process assumes.

In regard to catarrhal inflammation or, as it is generally called, catarrh, the same may be said; properly speaking, it means that form of inflammation of a mucous membrane which is characterized by an excessive discharge of mucus or mucopus; but a better usage in the direction of an exact classification would suggest that the local designation should be prefixed, as nasal, laryngeal, bronchial catarrh, etc.

CHAPTER III.

METHODS OF TREATING MUCOUS MEMBRANES, AND THE USE OF INSTRUMENTS.

In order to avoid unnecessary repetition when we come to the consideration of special diseases, it would seem best to devote a chapter here to the consideration of the various methods by which topical remedies are applied. It is safe to say that the success in the management of those affections which require local medication is due, not so much to the remedies used, as to the thoroughness and efficiency with which the parts are reached. This thoroughness and efficiency is only attained in many cases by the use of ingeniously devised instruments, combined with a certain nicety and deftness of manipulation. The idea is by no means intended to be conveyed that these diseases should be treated at the hands of experts alone, for I have always entertained the conviction, and urged it in my teaching, that the laryngoscope should be in the hands of every physician, not as a piece of ornamental office furniture, but as an efficient and indispensable aid in the diagnosis and treatment of diseases of the air-passages, and that the special skill necessary to use it intelligently, and to manipulate the instruments requisite for the efficient treatment of diseases recognized by its aid, is acquired with the utmost facility and ease by any physician who will devote to it the time needed to master its simple philosophy; and who also possesses that general deftness in the manipulation of all instruments which becomes natural and easy to every practitioner.

The usual applications that are made to mucous membrane may be classified as *solids*, *powders*, and *liquids*.

Solids.—The use of solids for topical application is somewhat limited; nitrate of silver, either pure or in the mitigated form, being used more than all others. This may be used with the ordinary porte-caustique of the pocket case in the anterior

nares or mouth, but when there is the least danger of its becoming detached and falling into the air-passages, the simple device should always be resorted to of fusing it on the end of a wire which may be bent at any angle to fit it for the special application it is desired to make. Mackenzie recommends for this purpose an aluminum wire, slightly roughened at its extremity, which is to be dipped into the silver, fused over a spirit-lamp. An ordinary copper or steel wire answers the purpose quite well. It may be held in the flame for a moment, and then touched to the stick of caustic, and by its own heat it will melt a small amount, which, adhering to it, is quite sufficient for a single application.

Other agents, such as alum, sulphate of copper, borax, chromic acid, etc., may be used in the solid form, but, as a rule, where they are used for their astringent properties, they are more efficacious in the form of powders, or in solution.

Powders.—The use of powders, or snuffs, as topical remedies, provided they are properly and thoroughly applied, is of very great value in the treatment of diseases of the upper air-passages, but, undoubtedly, in many cases they fail of their proper effect by not thoroughly reaching the parts which it is desired to medicate, while in others they do harm by not being properly used. This is in the main due to the instruments by which they are applied.

Various powder blowers or insufflators have been devised, some of them excellent instruments, while others are, undoubtedly, at times, not only inefficient, but even mischievous.

Fig. 44 represents the Rauchfuss insufflator, a fenestrated

Fig. 44.—Rauchfuss powder insufflator.

tube bent at its extremity to adapt it for carrying the powder in the desired direction. At the other end is fitted a rubber air-ball. A movable slide fits over the fenestrum. The powder having been placed in the tube through the fenestrum and the opening closed by the slide, a quick pressure on the air-bulb drives a current of air through the tube, which carrying the powder before it, deposits it in a mass upon the part to be

medicated. The one advantage of the instrument is that it enables the operator to estimate the exact amount of powder used. The disadvantage of this class of instruments is that the powder is deposited in mass, piled on the part, as it were, and where these are especially sensitive, may cause irritation, and thereby do harm. They also fail to thoroughly diffuse it, where it is desired to medicate a large surface, or reach throughout a sinuous cavity.

Fig. 45.—Lefferts' modification of Rauchfuss' insufflator.

Fig. 45 represents a modification of Rauchfuss' instrument,

Fig. 46.—Powder insufflator with mouth-piece.

by Dr. Lefferts, in that the air-bulb is placed on the upper side of the tube in such a position that it is pressed by the forefinger, in place of the thumb, as in the original instrument.

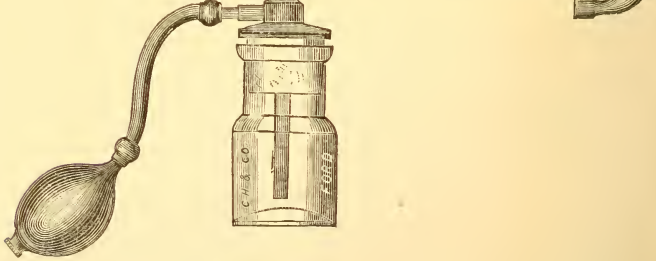

Fig. 47.—Smith's powder insufflator, with movable tips for making applications to the anterior or posterior nares, and larynx.

This is an improvement only in that it renders the manipulation somewhat less awkward.

Fig. 46 represents another device, in which there is substi-

tuted for the air-bulb a piece of rubber tubing, terminating in a mouth-piece. As will be seen, the powder is simply blown upon the parts. This is a far more efficient instrument than either of the others, in that the powder is more thoroughly diffused by the stronger current of air by which it is propelled.

Fig. 47 represents an insufflator, first suggested, I believe, by Dr. A. H. Smith, of New York, which consists of a wide-mouthed bottle, through the cork of which there pass two tubes bent at right angles above; to one of the tubes is attached an air-bulb, while the other is bent at its distal extremity, upward or downward, or in whatever direction it is desired to carry the powder. The tube to which the air-bulb is attached passes down into the lower portion of the bottle, while the other merely passes through the cork. The powder having been placed in the bottle, a quick pressure on the air-bulb drives a current of air down into the bottle, which striking the powder stirs it up into a cloud, and at the same time drives it out through the other tube, and deposits it upon the part it is desired to medicate, in a state of fine and even diffusion. This instrument can be obtained of the instrument makers, made of hard rubber, or any one having a stock of glass tubing may make his own supply. This is unquestionably the best insufflator in use. Its advantages are that it thoroughly diffuses the powder; that it deposits it in a smooth, thin film; that it does not pile it on any of the parts, and that it carries it throughout the sinuous cavities. Its only disadvantage is, that it does not enable the operator to estimate nicely the amount of powder used, though as a rule this is of no consequence. Fig. 48 illustrates Stoerck's insufflator which combines the advantages of all the above-mentioned instruments. It consists of a small central chamber for the reception of the powder, fitted with a movable cover. Projecting from this is the long curved tube for directing the medicament to the part it is desired to reach.

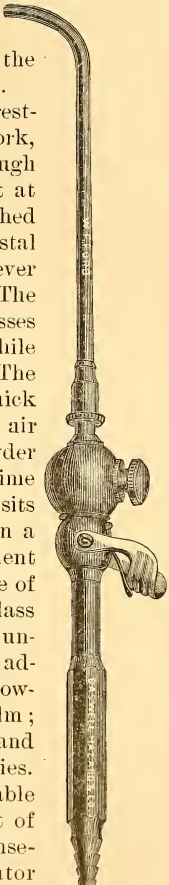

FIG. 48.—Stoerck's powder insufflator.

At its proximal end it is fitted with a tapering socket communicating with the powder chamber by a tube containing a spring cut-off. This instrument is intended for use in connection with the compressed air apparatus. Its working is obvious; the distal point being placed in position to throw the powder in the desired direction and the instrument connected with the air-chamber, pressure on the valve lets on a sudden blast, which drives the powder to the spot intended to be reached.

The advantage to be gained by the use of powders is a certain amount of permanency of action, as they remain for some time in contact with the part, and becoming slowly dissolved in the mucus, are absorbed by the membrane. The remedies usually employed in this form are, tannin, bismuth, alum,

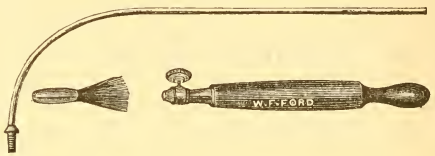

Fig. 49.—Tuerck's brush.

borax, ferric alum, zinc, nitrate of silver, iodoform, opium, morphia, belladonna, benzoin, sanguinaria, galanga, etc.

When it is necessary to reduce the strength of an agent, it may be combined with pulv. cretæ, pulv. acaciæ, magnesiæ carbonat., sacch. alb., etc. If the powder is heavy it may be rendered lighter by combining with powdered starch or lycopodium.

Liquids.—In the form of alcoholic tinctures or watery solutions, liquids form a large proportion of the remedies ordinarily used for topical medication.

They are applied by means of the brush, sponge, cotton pledget, syringe, douche, and in the form of spray, by one of the numerous devices for atomization.

The brush.—For convenience and cleanliness it is well to have some such an affair as Tuerck's brush, shown in Fig. 49, which consists of a wire mounted in a handle and with a thread turned on its distal end. It is supplied by the instrument makers with a dozen or more camel's-hair brushes, mounted in

brass sockets, of various sizes, which may be screwed on the handle as needed. It can easily be adapted for the different applications in the larynx, pharynx, etc., by simply bending the wire.

Fig. 50 represents Mackenzie's brush, which consists of a horn-mounted camel's-hair brush on the end of a wire which is bent at an angle nearly approaching a right angle. Of course for applications to the pharynx or anterior nares the ordinary quill brush, mounted on a slender holder, is all that is necessary.

The use of the brush is much resorted to, especially among the English and Germans, and largely in the treatment of laryn-

Fig. 50.—Mackenzie's brush.

geal diseases, as well as diseases of the pharynx. It has always seemed to me that, when it is desired to nicely localize an application, the brush fails to accomplish it, and, on the other hand, when it is desired to treat broad surfaces, especially in the larynx, that we have other and far better methods. There is also the annoyance of hairs becoming loosened from the brush and falling into the air-passages.

Cotton pledget.—A very simple method of applying liquids is by means of an ordinary probe wrapped with a small pledget of cotton. It is cleanly, it avoids dripping, and it localizes very nicely when it is desired to touch only a small diseased surface. All that is necessary is a piece of ordinary wire, which should be roughened at its end to prevent the cotton from slipping off and dropping into the air-passages. To adopt it for the different applications the wire can be easily bent in any direction. A very ingenious device for using the cotton pledget, consists of a wire, on the end of which is turned a coarse thread, which renders the escape of the cotton impossible; and also,

which is of no little convenience, renders the removal of the cotton, after using, extremely simple ; the wire point is merely unscrewed from the cotton.

Sponges.—The main objection to the use of the sponge is that there is a danger of its becoming detached from the sponge-holder and falling into the air-passages. This danger being obviated by the use of a safe and reliable instrument, the sponge

Fig. 51.—Ordinary sponge-holder.

is unquestionably preferable to either the brush or cotton ; in that it holds the medicated fluid well in its meshes, and avoids dripping ; it is cleanly, a new piece being used for each application ; it is convenient, and can be easily fashioned, in size and shape, to adapt it to each case in which it is used.

Fig. 51 represents the simplest form of holder, a split wire with toothed jaws which are held together by a sliding ring.

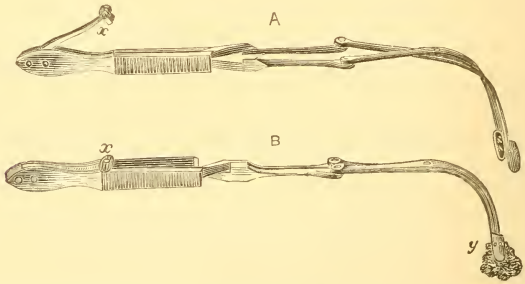

Fig. 52.—Elsberg's spring forceps sponge-holder, with Mackenzie's modification, consisting of : a safety wedge (x) ; A, the forceps open ; B, the forceps holding the sponge. The safety wedge (x) is raised in A, but closed in B. (Mackenzie.)

The teeth are very liable to become eroded by the agents used, and thereby their grasp of the sponge becomes insecure.

Fig. 52 represents Elsberg's spring-forceps sponge-holder. The same objection lies against this instrument as against the former, that the teeth easily become rusted or eroded. There is the additional objection that the grasp of the sponge is only by the strength of the spring, which is at least unsafe. Macken-

zie has added to this, a wedge shown at x in Fig. 52, which renders it more secure.

Fig. 53 represents Elsberg's improved sponge-holder, unquestionably the best and safest instrument yet devised. The figure easily explains itself. The intrument consists of two blades

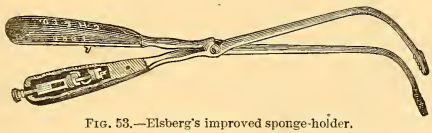

Fig. 53.—Elsberg's improved sponge-holder.

joined together by the ordinary obstetric forceps lock. While the instrument is in use the handles are held together by the slide and the sponge is grasped with perfect security; as soon as the slide is withdrawn the blades fall apart and the sponge

Fig. 54.—Post-nasal syringe.

falls out. The facility with which the instrument can be cleaned is an additional recommendation.

Syringes.—Fluids may be thrown against the diseased membrane of the larynx, pharynx, or nasal cavity by means of syringes, of forms variously devised for special ends. Fig. 54 shows the ordinary post-nasal syringe, a common barrel syringe,

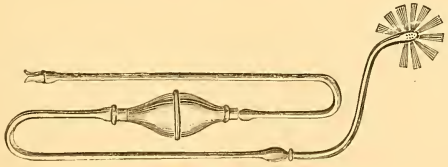

Fig. 55.—Post-nasal tube fitted to Davidson's syringe.

fitted with a curved tube which terminates in a rose douche, delivering jets in every direction. This may be passed up behind the soft palate for injecting through the nasal cavities, or it may be turned downward for injecting the pharyngeal cavity. Fig. 55 represents the pipe of the same syringe fitted for using

with the Davidson syringe. It is equally adapted to the fountain syringe. For injecting through the anterior nares an ordinary ear syringe answers the purpose very well, but better still is the post-nasal syringe shown above (Fig. 54), with the tube straightened. This can be introduced well into the cavity if desired.

Fig. 56 represents an ingenious little syringe for injecting a small quantity of fluid into the laryngeal cavity, which consists of a hard rubber tube of small calibre bent at the proper curve for reaching into the larynx. A small chamber on its upper side which is covered by a rubber diaphragm communicates with the hollow of the tube. Its action is sufficiently obvious. The point of the syringe being immersed in the fluid to be used, the finger is pressed on the diaphragm and the air is thus expelled from the chamber. As soon as the pressure

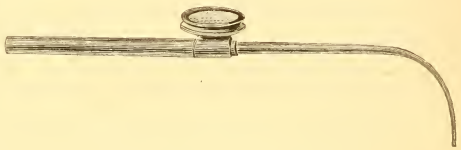

Fig. 56.—Hartewelt's laryngeal syringe.

is removed the fluid passes into the chamber, from which it is again easily discharged at will upon the part to be medicated in as small a quantity as may be desired. Syringing is rarely resorted to in the laryngeal cavity, but in the nasal cavity is almost indispensable. The force with which the stream is driven, and the direction in which it is thrown, being entirely under the control of the operator, the thorough cleansing of the parts is accomplished with comparative ease; for it is in this preparatory cleansing that the syringe is of the most value in the treatment of catarrhal affections.

The nasal douche.—The principle on which the nasal douche is constructed is, that if a fluid passing from a vessel held at a distance above the head, and flowing through a tube, is allowed to enter one nostril, the head being inclined forward, it will fill the nasal cavity of that side on which it enters and, overflowing the septum, pass out through the other nostril, the soft palate elevating itself and preventing the fluid from escaping into the pharynx.

Fig. 57 represents the ordinary form of the Weber douche. The reservoir may be a simple cup of tin, or a glass bottle.

Fig. 58 represents a simple device for accomplishing the same purpose, suggested by Thudichum. It is composed of a rubber tube, with a heavy metal perforated disk at one end, and a nose-piece at the other end. By filling the tube by suction or immersing it in the fluid, and dropping the weighted end in a jar of fluid held above the head, a syphon action is established, and an excellent douche is obtained with a much simpler and more portable apparatus. To avoid the difficulty and awkwardness which many patients encounter in their attempts at filling the syphon douche and getting it to work properly, Cohen has added a compression bulb to the tube, as shown in Fig. 59. The syphon being in position, a single pressure on the bulb, while the tube at the nasal end is closed by pinching in the fingers, will be sufficient to fill it with the fluid and set it in action. Fig. 60 illustrates the method of using

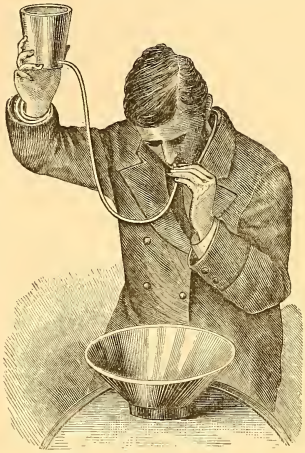

Fig. 57.—Weber's nasal douche with method of using it.

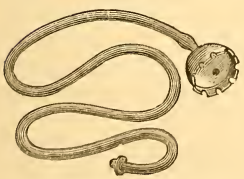

Fig. 58.—Thudichum's syphon douche.

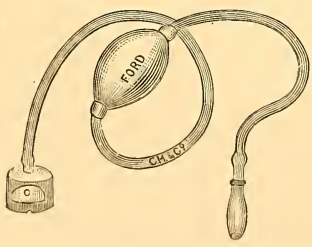

Fig. 59.—Cohen's modification of Thudichum's syphon.

the syphon. The true value of the nasal douche is in the facility with which it can be used by patients suffering from nasal disorders, in the intervals of treatment at the hand of the phy-

sician. It aids the physician in his efforts to cure these obstinate affections, and palliates and relieves the symptoms of the patient; but that it ever accomplishes a radical cure is questionable. The flow of the medicated fluid through the nasal cavity is very slow and sluggish, and certainly in the more aggravated cases fails to cleanse the parts of the masses of dried mucus and pus which lodge in and adhere to the sinuous cavities of the nose. It is very doubtful, also, whether the fluid more than reaches to the middle meatus, it being more probable that most, if not all of it, passes through the inferior meatus.

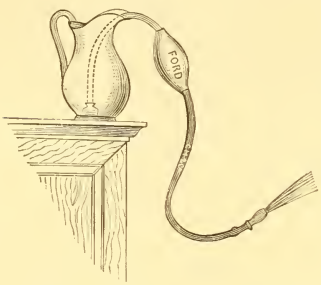

FIG. 60.—Method of arranging the syphon douche. (Cohen.)

It has been charged by Knapp, Roosa, and others, that the use of the nasal douche has caused inflammation of the Eustachian tube and middle ear, with consequent loss of hearing. When we consider the very large number of persons with impaired hearing as the result of catarrh of the naso-pharyngeal cavity, extending to the auditory apparatus through the Eustachian tube, and who have never used the nasal douche, it becomes a nice question to decide as to how far the douche is responsible for deafness occurring in those who may have used it. Certainly there is fair ground for regarding it an open question whether the use of the douche or the original catarrh is responsible for the impairment of hearing. Still the instrument should never be used without keeping in mind this possible danger.

The fluids used should always be rendered of a decidedly alkaline reaction, by the addition of common salt, soda, lime-water, or some other simple agent, and should be of a temperature not below 70° or 80°.

Atomizers or spray producers.—The idea of making use of fluids in a state of fine subdivision for application to the air passages, dates back as far as 1849, when the proprietor of one of the medicinal springs of France, thinking that if the waters of the spring possessed any virtues when taken into the alimentary canal, their benefits might be greatly enhanced when

taken into the air-passages, conceived the plan of projecting a large number of small jets of the water against the wall of a room especially prepared for the purpose, thus breaking it up into a state of fine atomization and filling the room completely with the spray. Into this room, patients well protected by rubber oversuits were introduced for the purpose of inhaling its surcharged atmosphere. The idea was received with great favor by medical men, and immediately adopted as a most valuable addition to our methods of treatment; but the plan by which the atomization was accomplished has been improved upon and simplified to such a degree, that we now possess a large variety of ingenious little instruments which render topical treatment by atomized fluids not only very simple but quite efficacious.

There are two principles on which these instruments are constructed. One of these is best illustrated by the atomizer,

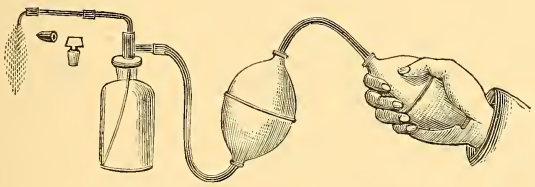

Fig. 61.—Richardson's atomizer with double bulbs.

generally known in this country as Richardson's, shown in Fig. 61. The projecting portion consists of two hard rubber tubes, one within the other. To the outer tube is fitted, at its distal extremity, a movable cap, perforated in its centre by a small opening. The inner tube passes from immediately behind the opening in the cap, through the centre of the outer tube, through the neck of the reservoir, and down into the fluid. The small projecting nipple on the neck of the bottle or reservoir, is for the attachment of the air-bulbs which furnish the air-pressure. It opens into the larger tube, and also communicates with the reservoir. As will be seen, when a current of air is pumped in by the bulbs, it is divided into two streams. One stream passes into the reservoir above the fluid, where, being compressed, the fluid is forced up through the central tube and driven in a small jet against the opening in the mov-

able cap. The other current from the air bulb passes into the larger tube and escapes through the opening in its movable cap. The small jet of the fluid striking against the edge of the small opening in the cap, and at the same time meeting with the current of air escaping therefrom, is broken up into a fine spray, and in this state is carried with the current some distance beyond the tube. In order to deflect the current of spray upward or downward, a separate movable cap is supplied, fitted with a curved projection, as shown in the figure.

A single air bulb of course would give an intermittent current; hence to overcome this there is added a second and more

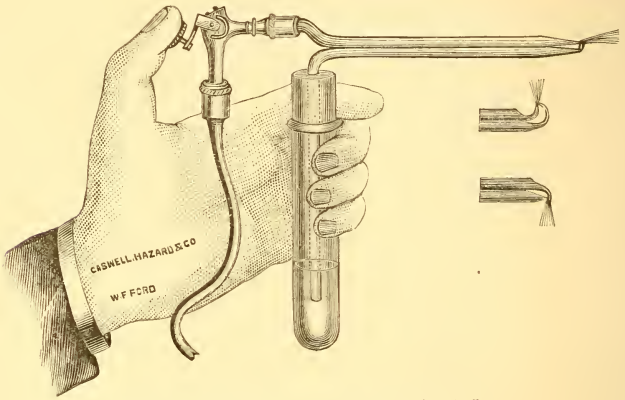

FIG. 62.—Sass's spray tubes with the automatic cut-off.

elastic bulb, between the hand-bulb and the atomizer, which receiving the air from the hand-bulb and becoming distended, exerts a continuous pressure by its elasticity, and furnishes a steady and constant stream of the spray. A larger set of bulbs, constructed on the same principle, but designed to furnish a more powerful current of air, is shown in Fig. 64, the foot being used in place of the hand. The other principle on which atomizers are constructed is that of Bergson. This is best illustrated by what is generally known as Sass's spray tubes, which consist of two heavy glass tubes joined together, as shown in Fig. 62. To one of the tubes is attached the tubing which is connected with the air-pressure, while the other leads down into

the reservoir containing the fluid designed to be atomized. The extremities of the tubes are so fashioned that the current of air from the air-chamber strikes against the orifice of the tube leading to the fluid, at a right angle, thus creating a tendency to a vacuum at that point by which the fluid is drawn up in the tube, and overflowing its extremity, is broken into a fine spray by the jet of air which strikes it as it escapes. The tips of these tubes may be fashioned to throw a current upward, downward, or forward, as shown in the figure. This is the principle on which the ordinary cologne atomizers are constructed, which are sold in the drug stores. There is also shown in Fig. 62 a convenient little stop-cock or cut-off attached to the spray tube, by which the current of

Fig. 63.—Single hand-ball atomizer.

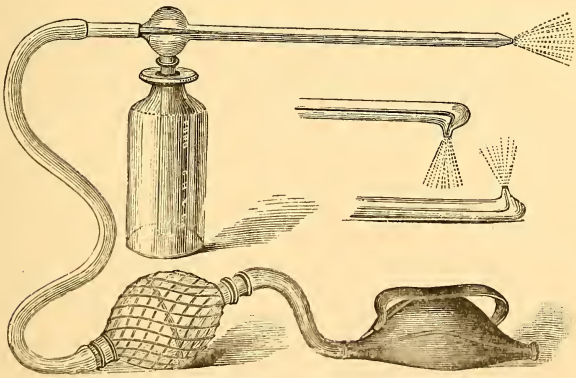

Fig. 64.—Newman's spray tubes, with air-bulbs for use by foot-pressure.

compressed air may be let on or shut off at will. Of atomizers constructed on this plan quite a useful little affair is that shown in Fig. 63. It is a very simple and inexpensive instru-

ment, and convenient for ordinary applications to the nose or throat where an instrument is desired for family use.

Dr. Newman, of New York, has devised an ingenious modification of the Bergson tubes, in which one tube, as shown in Fig. 64, is contained within the other, the principle on which it operates being the same as that of the Sass tubes. This is an excellent atomizer, producing a fine spray; the main objection is that it is extremely fragile. For the Richardson atomizer or Newman's tubes, sufficient pressure is obtained by the use of the double air-bulbs, but it is often desired that a stronger pressure should be available. For this purpose an air-pump and receiver may be used, as shown in Fig. 65, attached to the Sass

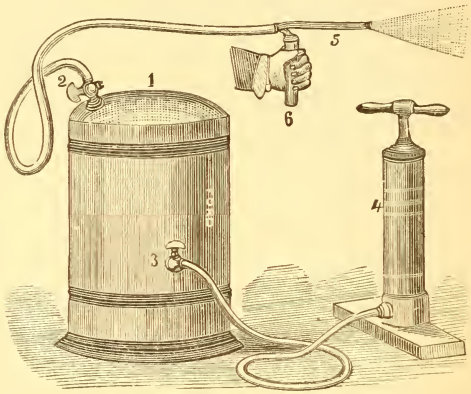

Fig. 65.—Air-pump and receiver.

tubes. The advantage of the air condenser, by which a pressure reaching as high as fifty pounds can be obtained, cannot be overestimated, for where it is desired to make applications to the sinuous cavities of the nose, or to the larynx, the feeble pressure obtained by the use of the air-bulbs is insufficient. Another objection to the use of the air-bulbs is that the current of spray is not absolutely and immediately under the control of the operator; that is, it cannot be let on or shut off at the instant often desired. As will be seen by the figure, this object is easily obtained by the use of the air-receiver. The atomizing tube being attached, and the receiver being charged with air, the current is held under control by the thumb pressed firmly against the

proximal end of the tube, or by the automatic cut-off shown in Fig. 62, and the pressure can be let on or shut off instantaneously, and at will. A serious objection to the use of the pump and receiver heretofore has been the high price at which they are sold; they can now, however, be obtained at a cost that ought to be within the reach of every practitioner who is called on to treat even a moderate number of catarrhal cases, as by their use a greater thoroughness and efficiency is obtained in making topical applications to the upper air-passages than by any other method.

MAKING APPLICATIONS.

In making applications to the pharynx and anterior nares the method is sufficiently obvious and requires no special directions. But the method of making applications to the larynx and posterior nares requires some further remark.

Applications to the larynx.—Passing a probe, brush, or sponge into the larynx for the purpose of medication demands a special skill only obtained by practice. Before the introduction of the laryngoscope it was claimed by Horace Green and others that the probang could be passed directly into the larynx and trachea. Whether this was really done by Dr. Green, has been called in question; certainly in our day no one would dare attempt this manipulation without the use of the laryngeal mirror. In making this application, the mirror being placed in position, held in the left hand, the brush or sponge is passed directly back to the fauces until its image is seen reflected in the mirror. It is then turned and passed directly down into the larynx, the important point being always held in remembrance, that for the proper accomplishment of this procedure, the brush or sponge should never be lost sight of until it has reached the part it is desired to medicate. This to a beginner will oftentimes prove an extremely awkward and difficult manipulation, and as a rule should not be attempted on the living subject, for the first time, but should only be resorted to after some practice on the model or some other of the many simple devices which have been suggested. I have generally directed my students to practise the following plan: a small, wide-mouthed bottle being placed behind a book is made to represent the larynx, the laryngeal mirror being held above it and

the light thrown upon it from the head-mirror, the student is directed to pass the laryngeal probe, by the aid of the mirror, into the bottle and down upon a bit of paper or other object lying upon the bottom. By a little simple practice of this kind the beginner will easily acquire sufficient skill to make application to the living larynx. The special skill required is that of guiding the point of his laryngeal probe or brush by the reflected image rather than by the direct view. The application of sprays to the larynx has been objected to on the ground that they are unphysiological and impracticable; these objections are certainly not tenable. The larynx in health is extremely sensitive and intolerant of the introduction of any foreign substance. This characteristic is still more marked in disease. In making applications to the larynx, then, it is desirable that this sensitiveness should as far as possible be respected. The use of the probe, the brush, or the sponge in making topical applications, necessarily involves the carrying into the organ, as a vehicle for the agent employed, a more or less rude, hard, or harsh foreign body. In the use of the sprays for laryngeal applications, the vehicle by which the topical agent is carried to the part in no way touches or impinges upon the diseased surface, but on the contrary, the fluid is deposited in a state of fine atomization, is showered on the part as it were, thus reaching it in a way which certainly on theoretical grounds ought to prove the least irritating, the most thorough, and the most efficacious of all our methods of treating the larynx. The charge that spraying the larynx is unphysiological, can only be met by the assertion that the same law holds good in regard to most measures to which physicians are compelled to resort in the management of disease: and furthermore that if the use of the spray is open to this objection, the use of the brush, the sponge, and the probe are far more so. The charge that the application of atomized fluids to the larynx is impracticable needs no comment. That the spray can be thrown directly into the laryngeal cavity, if the atomizing tubes are properly manipulated, cannot be questioned. In accomplishing this procedure the tongue should be protruded and held between the thumb and forefinger of the left hand, while the laryngeal spray tube, held in the right hand, is passed into the mouth until its beak is beyond the crest of the epiglottis. The patient should now be directed to sound "ah," when the pressure be-

ing let on, the whole cavity will be flooded with the spray. The act of phonation, of course, closes the rima-glottidis, and thus the fluid does not make its way beyond the vocal cords.

I have long entertained the conviction, that in the spray we have a method of reaching these parts more thorough and less irritating than any other, and for this consideration long ago abandoned almost entirely the use of the brush and sponge except in those cases where it was desired to nicely localize the action of a remedy.

Applications to the upper pharynx.—The main obstacle to reaching the upper pharynx with topical agents is the tendency on the part of the palatal muscles to contract on the slightest provocation, thus closing up the opening through which the applications are made. To surmount this hindrance the main reliance will be on educating the patient to a proper control of the faucial muscles, by which the palate may remain completely relaxed and the naso-pharyngeal orifice patulous. To secure this access to the upper pharynx, various palate retractors have been devised, as mentioned on page 28; these instruments are not well tolerated as a rule. Failing these, resort should be had to the method of securing retraction of the palate suggested by Dr. Wales, as mentioned on page 29. Open access having thus been obtained to the upper pharynx, applications may be easily made by the probe, brush, sponge, or spray. The use of the spray of course requires that the palate should be retracted or relaxed, while the other methods of application are available even if the palate is drawn up, the instrument being crowded through the contracted opening, though of course in this procedure more or less of the fluid is liable to be pressed out and trickle down the pharynx into the larynx.

The steam atomizer.—This is a rather ingenious and attractive little instrument, in which an atomizer on the principle of the Bergson tubes is worked by the action of steam. This plan was first suggested by Dr. Siegle, of Stuttgart. Fig. 66 illustrates the ordinary form in which the device is made use of. The steam atomizer is undoubtedly of much value in many of the catarrhal affections of the upper air-passages, if properly used. It is also without question an instrument of mischief if improperly used. As the rule, it should never be used in chronic catarrhal inflammation, as the hot steam has a tendency

to produce relaxation and congestion of the parts. In acute inflammatory affections, on the other hand, it serves oftentimes a most excellent purpose, as in acute and subacute laryngitis; acute tonsillitis, etc. The method of using the instrument is of course obvious.

Inhalations.—This method of treating mucous membranes consists in the utilization of the principle that certain drugs give off their volatile element under the action of hot water,

Fig. 66.—The steam atomizer after the principle of Siegle.

and that this volatile agent may be carried directly to the diseased surface by inhaling the vapor of the hot water impregnated with the agent. Among the remedies used in this manner are, lupulin, benzoin, ol. picis, creasote, carbolic acid, opium, hyoscyamus, etc. This method is also valuable in acute affections, but as a rule should not be used in chronic inflammation. A simple method of carrying out this plan of treatment is to place a small amount of the drug to be used in an open-mouthed bottle, or a tea-cup, and add a portion of hot water at a temperature of not less than 160°. The cup is then held under the mouth, and the medicated vapor inhaled. A number of instruments have been devised for the more elaborate carrying out of this plan of procedure, the most complete one being Macken-

zie's inhaler, shown in Fig. 67. This instrument is described by Mackenzie as follows:

"The inhaler consists of three parts, *a*, *b*, and *c*. *a* is an open vase, and is essentially the containing vessel into which the hot water and medicated solution are put. It is shown in A, with a pint of water in it, and above the water-line is a large space for steam; *b* is a kind of lid resembling an inverted tumbler, which forms the cover of the containing vase. It is seen in its proper position in *a*, and with the sides of the vase drawn diagramatically in *b*. The bottom of the tumbler forms the covering of the vase, and the sides of the tumbler dip down into it, leaving an air chamber between the two parts. When the vase contains the proper quantity of water, the sides of the inverted tumbler or lid dip down only about half an inch below the water-line. The circumference of the lid is perforated with small holes, as seen in *x*, and the circumference of what would be the rim of the tumbler is perforated in the same way at *z*. The apertures, both above and below, communicate with the air chamber. When the patient inhales, air rushes through the various holes above at *x*, then through the air chamber, again through the series of holes at *z*, and finally up to the mouth-piece, as shown by the course of the arrows. In the centre of the upper surface of the lid is a projecting nozzle, to which is attached a flexible tube, provided at its extremity with a double-valve earthenware mouth-piece. There is an opening in the lid through which a thermometer registering high temperature passes into the water. *c* is a stand on which the vase rests, and is made hollow to receive a spirit-lamp."

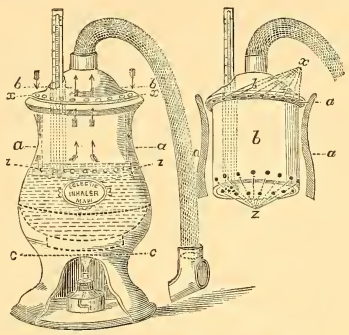

FIG. 67.—Mackenzie's eclectic inhaler.

As will be seen, in this instrument, the air which is inhaled is made to traverse the medicated solution, and thereby becomes more thoroughly impregnated with its volatile elements than is the case in the simple device of the cup or open-mouthed bottle.

CHAPTER IV.

TAKING COLD.

Although this is one of the commonest and most familiar of phenomena, both as a matter of clinical observation and of personal experience, if we ask ourselves what especial influences produces the morbid changes which we call taking cold, or what is the true relation between the recognized cause and observed effect, we find it somewhat difficult to give a correct answer to the question.

Among the numerous theories advanced may be mentioned that of Rosenthal. His theory is that the immediate effect of cold acting on the surface of the body is to excite contraction in the peripheral vessels by which the blood is driven from the surface in upon the internal organs, and acts there as an irritant, exciting inflammation. This view of the matter is somewhat mechanical, and scarcely explains the action of cold in many instances. Not infrequently, as the result of an exposure, it is not really internal organs that become the seat of the consequent inflammation, as an attack of acute eczema, or acute conjunctivitis, may follow; or in the case of the commonest of all inflammatory affections resulting from exposure, an attack of acute coryza affects a membrane so near the surface that under the action of Rosenthal's theory the blood should to an extent at least be driven from the membrane rather than that it should be flushed upon it from without. Furthermore, as we know, mere mechanical congestion does not lead to true inflammatory action, as shown by the old familiar and often repeated experiment of ligating the efferent veins of the frog's foot, and observing the result in the web under the microscope.

A far more plausible view of the matter is that of Seitz. His theory is that disorders resulting from catching cold are due to the removal of heat to an unusual extent from the external or internal surface of the body; that this causes some

functional disturbance, which in its turn gives rise to certain morbid processes distant from the part immediately affected by the cold. That the morbid changes are not due to the immediate or direct effect of this exposure, is evident from the fact that, as a rule, a certain length of time elapses before these changes set in.

The theory of Seitz, it seems to me, is not complete, but leaves the matter still somewhat in the dark. The true action of cold upon the body in producing morbid conditions is probably on those nutritive changes which are constantly going on, and by which the animal heat is developed. This heat-production is going on in all the tissues of the body. In order that this function shall not be impaired, it is necessary that the normal temperature shall be maintained. This we know is $98\frac{5}{8}°$. Any marked deviation from this normal standard, as the result of extraneous influences, results in morbid changes. If heat-production is arrested in a portion of the body under the action of an intense cold, molecular death of the part ensues, as is the case when gangrene of a limb results from freezing. If the action of the cold is insufficient to arrest the nutritive processes of the part, it may cause only inflammatory action. In these cases we have only the direct action of a low temperature on the organism. In the ordinary phenomena of "taking cold," we have still the result of a low temperature acting on the heat-producing processes, but in an indirect manner. The direct action of the cold is, as a rule, upon the surface of the body, but the resultant morbid condition is upon some organ remote from the exposed part. In both cases, however, the cause and effect are the same, and the connection between the exposure and resultant inflammatory condition is the disturbance of those nutritive changes in the tissues which result in the production of animal heat.

There are three factors generally necessary for the production of "a cold:" low temperature, air in motion, and moisture. It is also necessary as a rule that one or more of these factors should act for a somewhat prolonged duration of time. As we know, the momentary action of an intense cold or draft or moist atmosphere does not usually result in any morbid changes, but it is only after a somewhat prolonged exposure of the body that the familiar phenomena of a cold ensue. In our ordinary life there are few of us but that are subject

to slight temporary exposures with impunity; as for instance, upon rising in the morning in a cold room, changing one's clothes, etc. On the other hand, the sitting in a draft for a prolonged period, with even only a small portion of the body exposed, may lead to serious or grave morbid changes. Among the most familiar causes of taking cold may be enumerated, sitting in a draft, wearing insufficient clothing, wearing thin-soled shoes, insufficiently protected feet, going from a warm room to a cold room, slight exposure while perspiring, etc. Wearing thin-soled shoes, or insufficiently protected feet, is a very prolific source of trouble; as the loss of heat in this manner is far greater than is usually recognized. Especially is this the case if the soles of the shoes are damp, as in this case of course the radiation takes place much more rapidly.

Again, when the body is perspiring, the loss of heat is going on with considerable activity; hence we find that in this condition even a slight exposure is liable to result in far more serious disturbance than would occur from the same exposure were the body not in an overheated condition. There should, however, be borne in mind this difference, if the perspiration is the result of violent exercise, all the nutritive processes are stimulated to an abnormal activity, animal heat is being generated rapidly, and the perspiration necessarily sets in as a conservative measure, to prevent too great accumulation of heat in the system, but still as the direct consequence of the violent exercise. If now in this condition the body is exposed to the influence of cold, and the perspiration suddenly checked, very serious consequences may ensue. If, however, on the other hand, a copious perspiration is brought on by artificial means, while the body is in a state of quiescence, as in the hot room of the Turkish bath, the heat source is from without, the heat-producing forces of the system are not disturbed, and the cold plunge, while of course it suddenly checks the perspiration, does not, as a rule, give rise to any untoward consequences. Moreover, the exposure by the cold plunge is only temporary and of short duration, and by the subsequent manipulation, any serious loss of heat which may have resulted is speedily and completely restored.

A swimmer will remain in water at a temperature twenty or thirty degrees below that of the body, and that too for a somewhat prolonged period of time; but while in the wa-

ter he is in a state of constant and often laborious activity, thereby setting in play those processes by which animal heat is generated. But even with this constant activity, if the bath becomes too prolonged, there comes a time when the body is unequal to the task of supplying sufficient animal heat to make up for the loss, and the bather succumbs to the direct influence of this tremendous drain upon the system. As was said before, the loss of animal heat does not directly produce these morbid changes, but creates or gives rise to certain functional disturbances, with the nature of which we are not entirely acquainted, and these give rise, after a certain interval of time, to the morbid changes which we call taking cold. This interval may be short, lasting perhaps but a few hours, as is usually the case in slighter disorders, or it may be prolonged one or two days, or even more. In this case, as a rule, the resultant disorders are of a more serious character. There is generally attendant upon taking cold, fever of a more or less marked character. That this fever is not symptomatic, but an essential fever, is shown by the fact that it stands in no constant relation to the morbid changes which result, as in even slight disorders we may have the febrile motion more marked than the fever which accompanies the more aggravated forms of inflammatory troubles which may arise from the cold. Moreover, the fever generally sets in immediately after exposure, and when the later morbid changes appear, no increase of fever, as a rule, is detected. As regards the local disorders, which result from an exposure to cold, we find them manifesting themselves in any part of the body. We may have acute coryza, pharyngitis, gastric catarrh, muscular rheumatism, cystitis, or, in fact, an attack of inflammation involving any of the organs of the body as the result of a cold. Owing to their exposed situation, being the first to receive the current of inspired air with its impurities, or whatever of irritating qualities it may possess, the upper air-passages are perhaps more subject to inflammation than any other portion of the body, and once having become the seat of morbid changes there is always a liability to a recurrence of the attack from a slighter exciting cause than that which gave rise to the first attack.

Hence, it is probable that catching cold, in a very large majority of cases, develops in an attack of acute inflammation of some portion of the upper air-passages, as being the point of

least resistance, and, further, as these attacks recur with increased frequency and gravity, we find that the morbid process localizes itself farther down and nearer to the vital centres, and finally this liability, so called, to take cold, which at first manifested itself in attacks of simple coryza, or sore throat, gives rise to a bronchitis or some still graver affection which fixing itself upon the lungs may prove far less amenable to treatment than the simpler attacks which preceded it, or even lead to the development of those still graver forms of pulmonary disease in the management of which our present therapeutic resources are so feeble.

The question is often put to the physician whether a catarrh will lead to the eventual development of lung disorders; and it seems to me that the answer should be that it may, and that it often does, in the manner above noticed.

This may not occur by absolute extension of the inflammatory process, but there can be no question that an individual suffering from a chronic laryngeal catarrh is far more liable to an attack of tracheitis, and that one suffering from a tracheitis is far more susceptible to a bronchitis than one in whom there exists no catarrhal inflammation, and so on down to the deeper lung tissues. Other causes of course may operate in inducing such a sequence of events, such as an impairment of the general health from any cause, but a prominent factor still remains in the existing catarrhal inflammation above.

As regards the so-called liability to take cold, it should be understood that this is, in a large majority of cases, and probably in every case, due to an existing chronic catarrhal inflammation, of perhaps so mild a type as to give rise to but very trivial symptoms, or even pass unnoticed; but still an existing catarrh, the result probably of a neglected cold, and the renewed attacks to which the individual becomes so liable, consists in a lighting up of the old trouble. As each fresh attack subsides, the resolution which the inflammatory process undergoes is less complete, the chronic trouble makes itself known by more decided symptoms, fresh colds occur with greater frequency, and there is finally established a chronic catarrh, be it laryngeal, nasal, or of any other part, with its many annoyances, its intractability, and unquestionably the possibility of its leading to graver trouble lower down in the air-passages.

Our concern of course is mainly with affections of mucous

membranes; but in those cases in which we find that a cold gives rise to an attack of rheumatism, gastric catarrh, cystitis, or any disorder other than a catarrh of the lining membrane of the respiratory tract, probably the same rule holds true as before; from some inherited tendency, or acquired weakness, the parts involved in these affections have become the points of least resistance, and hence invite those morbid changes which result from exposure to cold.

Prevention of a cold.—The natural deduction of course from what has been said before is, that those conditions which give rise to a cold should be avoided; especially should this be enjoined upon those possessing hereditary tendencies or weaknesses, and those of whom we speak as liable to take cold. These directions of course are more important in the months of the year when we have, to the greatest extent, the prevalence of those conditions which, as we have seen, are concerned in the production of a cold: as low temperature, moisture, and air in motion; this we find in Spring and Fall. Perhaps the most important direction that can be given in regard to preventing colds is in the proper regulation of the clothing. The body should be clothed sufficiently for warmth and comfort, no less and no more. If too little clothing is worn there will necessarily result a loss of animal heat. If too much is worn the body becomes overheated and perspiration necessarily ensues to reduce the temperature and restore the proper equilibrium, and consequently, as we have before seen, a condition arises in which the body is extremely sensitive, and in which it is especially liable to succumb to the influence of cold or moisture. This rule in regard to clothing the body applies to all parts of it. The mistake should always be avoided of coddling any portion, or of leaving any portion insufficiently protected. A very frequent and common error is fallen into by many, of crowding on too much clothing upon those portions of the body which they suppose to be subject to some special weakness; as for instance, many people supposing themselves to have weak lungs or throats, fall into the error of piling wrap upon wrap, muffler upon muffler, around their necks and about their chests, thereby encouraging the very condition which they fear, and incurring the risk they desire to avoid; for the excessive muffling of the parts necessarily leads to perspiration, and consequently the danger of its sudden checking upon the re-

moval of the wraps. I know of no more prevalent mistake, nor one which is a more prolific source of mischief, than the habit which prevails to so great an extent among us, of muffling up the neck. Especially is this the case when a cold is contracted which develops in a sore throat. As a rule, when a sore throat comes on, the very first remedy which is adopted is to tie a dirty red flannel about the neck. The only advantage of this procedure lies in a certain amount of counter-irritation due to the harsh fibre of the flannel rubbing against the skin. Aside from this, there is no possible good to be accomplished. It is put on for a protection, it simply renders the neck and throat more sensitive, and entails a greater liability to take another cold. Of course what is said about the neck may be said about any other portion of the body. Excessive covering should be avoided under all circumstances. This perhaps is a greater error than insufficient protection, although the latter is undoubtedly a frequent source of trouble. This may be said perhaps in regard to the feet quite as much as of any other part of the body, for coming in contact as they do with cold floors and pavements, especially when there is water or moisture on the ground, the loss of heat from the general system from that source is necessarily rapid, unless the foot is thoroughly well protected by a thick, dry sole to the boot. There are few but have experienced the direct effect of standing in slippers or thin-soled shoes upon a damp or cold pavement, and noted the rapidity with which such exposure makes itself felt. In our climate, with its sudden and marked changes of temperature, the proper regulation of the clothing becomes a matter of considerable importance, and perhaps of no little difficulty. The hands and face are rarely covered, as a rule, or protected, and yet we never take cold from their exposure. The deduction is obvious; if certain parts of the body may be exposed with impunity, the converse conclusion is suggested, that by keeping our bodies too warmly clad we have thereby engendered a necessity which possibly might have been avoided, with benefit to the health and vigor of the system. The rule may be safely laid down, that, in clothing the body, the trunk and limbs should be made simply comfortable, but never wrapped to the extent of inducing perspiration by the amount of clothing. The foot should be covered with a boot or shoe, with a sole sufficiently thick to prevent the cold or dampness of the pavement being felt

through it. The neck should never be muffled, or covered with thick wraps or furs, unless rendered necessary by the piercing winds or cold of midwinter, as a mere matter of comfort. The head is endowed by nature with its own protection; hats and caps are luxuries born of modern civilization; had they never been worn, mankind would be better off and the demand for hair restorers would never probably have existed. Hats and caps, however, being a necessity of modern life, should be light, well ventilated, and designed to retain as little heat as possible; they should not be too heavy or press with too much weight upon the head, the crown should be perforated to allow of as free circulation of air as possible between the top of the head and crown of the hat, and should be constructed of such material as will allow of the escape of heat.

The hair, the natural covering of the head should, be so regulated as to avoid the exposure resulting from the removal of a considerable amount at one time by cutting; if it possesses a luxurious growth, it should not be cut when the removal of so much protection of the head is liable to result in catching cold.

In short, the body in all its parts should be made comfortable. It should not be so clothed as to cause perspiration, nor that chilling can occur. It is said that seal-skin sacques have caused more deaths than small-pox in New York in the last five years. I have no doubt that this is quite true, and the fact is due simply to the vanity or indolence by which a woman will go from the cold air into a warm room, with her sacque on, and remain there for hours, it may be, without removing it. In addition, it might be said that very much harm is done by the habit of wearing heavy clothing, and sitting in overheated rooms. Those who allow themselves to grow into the habit, by which they are only comfortable in a room at 80°, are simply making hot-house plants of themselves, and are engendering a condition of the system which renders its resisting power very feeble. It is purely a habit, and one easily overcome not only without risk but with undoubted benefit to the individual in the increased vigor of body which will result.

These suggestions are, of course, such as every physician is familiar with; they are given here, however, more in the way of suggestions than for instruction, for we are far too prone to overlook and forget them in our dealings with our patients,

and allow them often to violate, through ignorance, simple laws of well living, whose observance might save them much suffering.

Treatment of a cold.—It is very much to be deprecated that as a rule an ordinary cold is allowed to take its own course without treatment. If a part has once become inflamed, and is permitted to undergo resolution without interference, it is left in a weakened condition which invites renewed attacks from a very slight cause; for when the acute inflammatory process subsides, complete resolution does not take place, but there is left a morbid condition, very mild in character perhaps, but nevertheless one of chronic inflammation. This may be so slight as to be scarcely noticeable by the patient, and yet it is this condition which takes on a renewed inflammation from a very slight provoking cause, which oftentimes the patient would escape did it not exist. The ordinary plan of treatment of a cold is so simple and involves so little trouble, that it is the duty of the physician to urge that all cases, however simple, should be subjected to it.

Remembering the causes, as laid down above, which operate in the production of a cold, the first indication for treatment will be to supply as promptly as possible the deficiency caused by this loss of bodily heat. If this can be done in the early stages, when the secondary inflammatory process has not progressed, or better still, before it has set in, viz., during the preliminary febrile stage, the further progress of the disorder may be promptly arrested; this constitutes what we generally call the abortive plan of treatment. This plan consists, in short, of producing copious perspiration; this perspiration, be it remembered, however, is not primarily the object it is desired to attain, but it is simply the evidence that that object has been attained. The condition to be corrected is loss of bodily heat; the measures resorted to for this are measures which have a tendency to increase bodily heat. The evidence that this has been accomplished, viz., the restoration of this heat, or even more, that an excessive heat is produced, is manifested by the perspiration. If this so-called sweating can be brought on in the early stage it serves the purpose of arresting the future progress of the trouble, and putting an end to the inflammatory process. If it can be brought about early in the progress of the inflammatory stage its gravity can be very ma-

terially lessened; hence, the earlier this abortive treatment is resorted to, the better the result. The means of accomplishing this is by simple remedies familiar to all.

A decoction of hot tea taken at bed-time, with the addition of a foot-bath and a moderate dose of Dover's powder, is all that is necessary; after which the body should be warmly covered in bed and extreme care exercised to prevent any exposure while the perspiration is going on. If the constitutional symptoms assume a graver form, that is if the fever seems excessive and the effect on the general system marked, much benefit in addition will be gained by the administration of ten grains of quinine in connection with the diaphoresis. It is generally asserted that following a copious perspiration there is danger of contracting additional cold on leaving the bed in the morning. This probably is a mistake, although the simple precaution should always be taken of allowing the body to cool off gradually before rising, by removing a portion, at a time, of the bed covering and also remaining indoors for a few hours after dressing. If, as the result of this treatment all symptoms disappear, little else is needed except the exercise of ordinary precaution.

If, however, the inflammatory stage has set in, and the result of the sweat has been simply to modify and not to remove it, other measures should be resorted to, directed to the special locality of the inflammation. The remedies indicated will be referred to when we come to treat of special diseases. Confinement to the house should be urged in all cases, as of equal, if not of greater importance than therapeutic measures, especially if the inflammatory condition shows any possible grave tendencies.

DISEASES OF THE FAUCES.

CHAPTER V.

CATARRHAL AFFECTIONS OF THE PHARYNX.

The use of the term fauces has been criticised as being indefinite and as referring to no specific region of the body. It is adopted here, however, in the absence of any better term, to describe the back part of the mouth and lower pharynx. This includes the soft palate, uvula, pillars of the fauces, tonsils, and that portion of the pharynx which is visible by direct inspection. To avoid confusion as to terms, it may be well here to define the anatomical relations of the parts to be treated, and to make plain what specific regions it is intended to designate when the different terms are used.

The pharynx.—This term properly refers to all that region which is situated between the nasal cavities, the mouth, and the larynx. It is bounded anteriorly by the posterior nares and mouth, above by the base of the skull, below by the larynx and œsophagus, posteriorly by the cervical vertebra, and laterally it lies upon the important blood-vessels and nerves of the neck, and is connected by the Eustachian tube with the internal ear. It is a somewhat conical-shaped cavity, broader above than below, about four and a half inches in length, lined with mucous membrane somewhat closely attached posteriorly to the vertebra, and loosely attached to other portions. Properly speaking it comprises two cavities, and in the use of terms in what will be said hereafter, that portion which is above the free border of the palate will be spoken of as the upper pharynx or the vault of the pharynx ; while on the other hand, when the term pharynx or lower pharynx is used, it should be under-

stood to refer to that portion which is visible on direct inspection, viz., that portion below the border of the palate.

The upper pharynx or vault of the pharynx is lined with

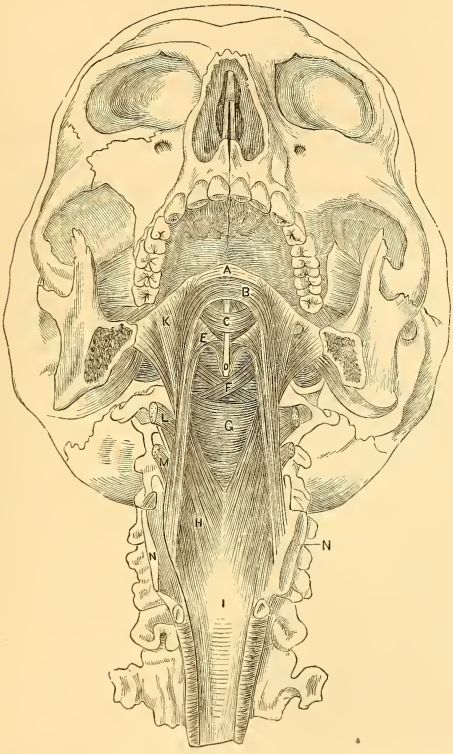

FIG. 68.—Anterior view of the muscles of the pharynx and palate after removal of the tongue, hyoid bone, and larynx as far as the posterior segment of the thyroid cartilage (Luschka): A, aponeurosis of the soft palate; B, thyroid portion of the palato-pharyngeus muscle; C, arch-like connection of the levator-palati muscle; D, Azygos uvula: F, G, bundle of constrictors in posterior wall of pharynx; H, pharyngeal portion, and K, palatine portion of palato-pharyngeus muscle; L, G'osso-pharyngeus muscle; M, hyo-pharyngeus muscle; N, posterior segment of thyroid cartilage; I, aponeurosis of the thyro-pharyngo-palatine muscle, below which are the longitudinal fibres of the œsophagus springing from it. (Cohen.)

mucous membrane covered by columnar ciliated epithelium, and is very richly endowed with glands, which are in this region mostly of the compound racemose variety. These glands

are aggregated to such an extent as to give it the name of the pharyngeal tonsil. They secrete an abundant mucus, which is poured out upon the membrane and serves to keep it in a soft, moist, and pliable condition. It is also squeezed out as it were in the act of deglutition, and serves to coat the bolus of food, thus facilitating its passage down the œsophagus.

The pharynx proper, or lower pharynx, viz., that portion below the border of the palate, is lined with mucous membrane more closely adherent to the parts than that of the upper pharynx. It is covered with squamous epithelium and is endowed with simple and compound follicular glands, somewhat sparsely scattered through the membrane.

The soft palate is a movable fold of membrane which is suspended from the posterior border of the hard palate. It contains a number of muscles by which it is acted upon, and is endowed with certain functions in connection with articulation and phonation, and also in the act of deglutition. With its action in the formation of the voice we need not concern ourselves further than to say that by its position, in partially or completely closing the nasal cavity posteriorly, it modifies the character of the voice, giving it or depriving it of its nasal tone.

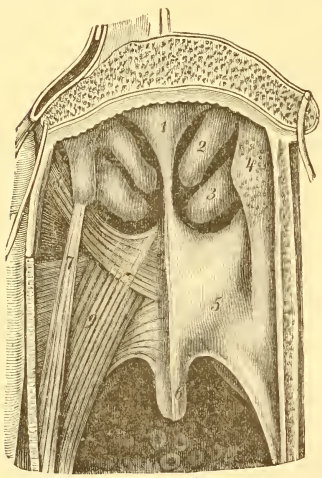

FIG. 69.—Anterior view of the naso-pharyngeal space; on one side the mucous membrane has been dissected away (after Luschka). 1, septum; 2, middle; 3, lower turbinated bone; 4, tuberosity of the pharyngeal orifice of the Eustachian tube; 5, soft palate; 6, uvula; 7, stylo-pharyngeus muscle; 8, levator-palati; 9, palato-pharyngeus muscle. (Ziemssen.)

In deglutition the palate is drawn firmly backward and upward against the posterior wall of the pharynx, completely closing the opening between the mouth and posterior nares, thus preventing the entrance of the bolus into the nasal cavity. This is mainly accomplished by the contraction of the palato-pharyngeus muscle, which forms almost a complete circular muscle resembling the orbicularis. This is shown in Fig. 68, which illustrates the distribution of muscles on the under sur-

face of the palate and on the wall of the pharynx. Fig. 69 shows the muscular distribution on the upper or nasal face of the palate.

Physiology.—The pharynx serves as a vestibule of communication between the nasal cavity, the mouth, the larynx, and the œsophagus. Its prominent function is in the act of deglutition. In this act the bolus of food is passed by the tongue toward the back of the oral cavity until it passes the palato-glossi muscles which form the anterior pillars of the fauces. Contraction of these muscles ensues by which the mass is prevented from re-entering the mouth. At almost the same time the palate is raised by the action of the levator palati, and the palato-pharyngei muscles which form the posterior pillars of the fauces contract and thereby close the opening into the vault of the pharynx, by which the mass is prevented from entering the nasal cavity. The larynx is next drawn up under the base of the tongue by the action of the digastric, mylo-hyoid and genio-hyoid muscles. By this movement the epiglottis falls upon and covers the rima glottidis, thus preventing the food from making its way into the air-passages. The bolus now makes its way over the anterior surface of the epiglottis, and passes from the control of the voluntary into that of the involuntary muscles of the pharynx, which is raised by the additional aid of the palato-pharyngei and stylo-pharyngei muscles to receive it, the constrictor muscles of the pharynx passing it on to the œsophagus.

Acute Catarrhal Pharyngitis, or Ordinary Sore Throat.

This is an acute inflammation of the mucous membrane lining the lower pharynx, which often extends to the soft palate, uvula, tonsils, and pillars of the fauces. It is usually moderate in character and limited in duration, and is the affection ordinarily designated as common sore throat, although this term is often applied to tonsillitis, laryngitis, and, indeed, to many of the milder inflammatory affections of the fauces.

It may be of so mild and trivial a character as to be attended with very little pain and discomfort, and accompanied with no symptomatic fever. In the more aggravated form, however, it may be ushered in by a chill, or chilly sensations, followed by

an active febrile motion. It may be confined to the lower pharynx alone, or it may extend to the pillars of the fauces, soft palate, uvula, and tonsils. In the majority of cases it is the result of taking cold, though, occasionally, it may be the result of direct injury, irritation from the inhalation of noxious vapors, an impure atmosphere, etc.

Symptoms.—If the attack is moderate in character, the attendant symptoms consist mainly in a mere sense of discomfort about the throat, with some little excess of secretion, and possibly slight pain in swallowing. In the severer cases, however, attended with an active inflammation of the mucous membrane, extending well forward on the palate, uvula, and tonsils, we find a considerable extent of swelling of the parts, with a tendency to œdema manifesting itself most markedly in the uvula, together with some swelling of the tonsils. In these cases, therefore, the symptoms become more decided, swallowing is painful, as the result of pressure on the diseased membrane, and difficult, from the fact that the muscles involved in the act are somewhat affected, especially the muscles composing the pillars of the fauces. The muscles are not inflamed, but they are liable to become the seat of a moderate degree of serous infiltration as the result of the activity of the inflammatory process involving the membrane covering them, thereby interfering with the proper performance of their function. The voice is apt to be somewhat thick and husky, with a decidedly metallic tone, due partially to a sympathetic irritation of the larynx, and partially to the fact that the inflamed pharyngeal surface fails somewhat in its proper function in acting as a sounding-board against which the vocal waves first strike on issuing from the larynx.

The general symptoms attending the affection may consist in a more or less well-marked febrile motion, manifested by an increased frequency of pulse, heat of skin, and rise in temperature to 101° or 102°, anorexia, etc., or there may be simply a feeling of general malaise, with loss of appetite and headache. Cough, as a rule, is absent, but there is a tendency to a hacking, or an effort to clear the throat from the accumulation of mucus.

Examination.—If seen in the early stage the mucous membrane, as far as the inflammatory process extends, presents a congested appearance more or less well marked, according to the severity of the attack; varying from a deep rose color to a

dark angry-looking red. At the first onset of the attack the secretion is somewhat scanty or entirely suppressed, the membrane presenting a dry and glazed appearance; as the disease progresses, however, a more or less profuse mucous or mucopurulent discharge sets in, and will be noticed covering and adhering to the parts. If the attack is an aggravated one, the membrane will be seen presenting a decidedly swollen and œdematous appearance. This will be especially marked in those parts where it is loosely attached, or where it lies upon loose areolar tissue beneath. This condition exists in the uvula to a greater extent than elsewhere, hence this organ is often markedly swollen and presents a humid and watery appearance.

The tonsils may be so far involved in the inflammatory process as to be raised somewhat from their bed, and to project from between the pillars of the fauces; the membrane covering them, however, presents the same congested color as that of the other portions of the fauces involved. The soft palate in these severer forms of sore throat is usually affected as far as its junction with the hard palate, from which point the congested color of the membrane shades gradually into the healthy tissue beyond.

The *diagnosis* is easily made in so simple an affection as this. It may be confounded with subacute tonsillitis or a follicular tonsillitis. In the first case, as a rule, the tonsil stands out prominently, and the inflammation of the mucous membrane surrounding it is limited in extent, and there is also the absence of the inflammation extending to the soft palate. Follicular tonsillitis may easily escape detection, unless a careful inspection be made, which will always, however, reveal the characteristic pearl-white exudation, showing itself at the mouths of the crypts of the tonsils.

Treatment.—The affection is not a grave one, but yet is one that may give rise to no little annoyance, and even suffering. If let alone its tendency is to undergo resolution in the course of a few days; still the same assertion holds good here that has been made before in regard to neglected colds; complete resolution does not, as a rule, take place, but there is left behind a certain amount of chronic inflammation of the membrane, which, although of a very trivial character, and giving rise to very slight symptoms, is still sufficient to involve a tendency

to a frequent recurrence of the attack. It is a matter of some little moment to the patient that this total restoration should be favored by certain simple measures which easily accomplish the object.

This is an affection in which the use of a gargle, provided it is properly managed, will prove an efficient method for reaching the diseased part. As ordinarily done, gargling fails to reach the diseased surfaces; the patient taking a mouthful of fluid throws the head back, causing the fluid to gravitate toward the base of the tongue, which is raised against the soft palate, thus completely shutting off the posterior wall of the pharynx: at the same time he allows a feeble current of air to escape through the fluid, giving rise to the peculiar gurgling sound; as will be seen, the fluid reaches no farther than the soft palate. A little training will enable one to allow the fluid to reach back to the pharyngeal wall. The proper method of gargling is to take the fluid into the mouth, throw the head back, and to commence the process of swallowing it; arresting the act, however, just at the point where the voluntary muscles act; that is the patient should attempt to swallow the fluid, but should stop before the act is complete, and at a point where it is possible for him to expel it again.

In going through with this procedure it will be found that the fluid can easily be allowed to pass completely into the pharynx, and down to the point where it will come in contact with its posterior wall, where it may be allowed to rest for an instant and can be rejected without its passing into the stomach. In ordinary sore throat of a purely catarrhal character, we possess no remedy more efficient than chlorate of potash. This may be used in the saturated solution of ʒ ss.— ℥ j. Among other astringents which may be used are borax, ʒ ss.— ℥ j., sulphate of zinc, gr. v.— ℥ j., and alum, gr. xx.— ℥ j. If there is much relaxation of the parts, with a tendency to œdema, tannic acid, ʒ ss.— ℥ j. may be used, or better still, perhaps, ferric alum, gr. xx.— ℥ j. In children who cannot be taught the use of a gargle, a very efficient method of administration will be found in the incorporation of the astringent with white sugar, to which may be added a small amount of powdered acacia, as follows: chlorate of potash, gr. xx.— ʒ j., sacch. alba and pulv. acacia, āā ʒ j. A small portion of this laid upon the tongue, becoming moistened with the saliva, is swallowed and comes in

contact with the inflamed membrane quite as efficiently, or, perhaps, even more so than by a gargle. Of course in applying a remedy in this manner no astringent can be used which would exercise a deleterious effect from being taken into the stomach.

Lozenges present a very simple and attractive method of treating an ordinary sore throat, and remembering that the disease possesses no grave features, and that even the trouble involved in the use of a gargle will be sufficient to cause the patient to neglect its use, a few astringent lozenges carried in the pocket, and which can be taken freely through the day, renders this form of medication of no little value. The ordinary chlorate of potash lozenge, made up with white sugar and sold in drug-stores, is an excellent form. The compressed tablets made by Wyeth & Co., of Philadelphia, present the additional advantage of size and convenience of carriage, and are generally to be preferred; they are supplied in the form of small disks of pure potash, and also in combination with borax, either of which forms are excellently well adapted for the relief of this affection. As regards other and general measures they are not usually indicated; yet if there is much constitutional disturbance, as evidenced by the amount of febrile motion, a saline laxative should be given, together with the administration of small doses of aconite. If there is much pain about the cervical region and angles of the jaw, cold compresses to the neck, frequently changed, will be found an efficient method of affording relief. Perhaps no habit is more universal, especially among the ignorant, than that of tying flannel around the neck in ordinary sore throat; it is a pernicious habit and should always be avoided.

Chronic Catarrhal Pharyngitis.

This is a chronic inflammation of the mucous membrane lining the lower pharynx, of a catarrhal character, commencing usually with an ordinary sore throat, undergoing imperfect resolution, and leaving behind it a moderate degree of chronic trouble as the result of repeated recurrences of the acute attack. There is gradually, slowly, but progressively developed in the pharynx that morbid condition in its mucous lining which has been before alluded to as constituting chronic

inflammation of a catarrhal character. This consists mainly in certain hyperplastic changes in the deep layers of the mucous membrane, with alterations in its blood-vessels and perversion of its function. The active arterial congestion which characterizes the acute form disappears and there is substituted for it a condition of engorgement of the blood-vessels which seems to assume a venous character, giving the parts a deep red, oftentimes purplish color; at the same time there are certain hyperplastic changes in the deep layers of the membrane, consisting mainly in its infiltration with the normal cell-elements developed in its meshes to an abnormal extent, together with an increased proliferation of the connective tissue and glandular structures of the tissue. As the result of these changes the membrane becomes thickened, and assumes a somewhat puffy appearance. This thickening does not present a smooth, uniform surface, but is irregular and somewhat nodular in appearance. It has a granular aspect, which gives it sometimes the name of granular pharyngitis. This is an utterly meaningless name, and it seems to me should be abolished. The normal secretions are also changed, and there is poured out upon the surface of the membrane a thick, tenacious, ropy mucus.

Commencing in the lower pharynx the inflammatory process extends often to the pillars of the fauces, tonsils, soft palate, and uvula, giving them the same deep, congested purplish color. Occasionally the tonsils become somewhat thickened, and rise from their bed, separating widely the pillars of the fauces, and present a flat, roughened surface. The soft palate may be involved as far as its junction with the bony portion, but more frequently the uvula alone is involved, being swollen, somewhat elongated, and markedly congested. In this condition it is liable to undergo those changes which result in so great an elongation as to require amputation.

The progress of the chronic pharyngitis is marked of course by repeated acute attacks of ordinary sore throat. As the disease develops under the stimulus of these repeated attacks of acute pharyngitis, or developing from the commencement as a chronic affection, as it occasionally does, it comes under the influence of certain secondary predisposing and aggravating influences whose effect is to greatly increase the morbid condition. The use of tobacco is a habit which it is the fashion to charge with having a large influence in the production and aggra-

vation of chronic pharyngitis. Smoking and chewing are, undoubtedly, pernicious and uncleanly practices, but that they are responsible to the extent usually laid to their charge in influencing a throat catarrh is probably not true. Tobacco smoke is without question an irritant to the mucous membrane of the air-passages, especially if inhaled in a concentrated form. On the other hand, it is also true that the mucous linings easily become inured to the action of the smoke, so that breathing or inhaling an atmosphere charged moderately with it is tolerated with impunity. Cubans are, perhaps, among our most inveterate smokers, and that in its worst form in the use of cigarettes, and yet they suffer somewhat rarely from throat catarrhs.

I do not wish to say that the use of tobacco may not, or does not, exercise an injurious influence on the throat, for it undoubtedly does in many cases, but that this is the result of the direct contact of the smoke with the membrane I regard as very improbable. The effect of smoking in producing gastric disturbance, as shown in the various forms of dyspepsia with which excessive smokers suffer, and this, in turn, leading to the aggravation of an existing pharyngeal catarrh, would seem to me to present the true explanation of the injurious action of the habit on the throat. And, again, the absorption of nicotine which necessarily takes place, as evidenced by the headache, palpitation of the heart, and muscular tremor which results from the excessive use of tobacco, produces a systemic condition which cannot but react unfavorably on the morbid process in the fauces. From what has been said it will be easily understood that while condemning the use of tobacco as a vicious and uncleanly habit, and asserting that its excessive use may exercise a very injurious influence on the throat, the idea is only intended to be conveyed that the pernicious influence is an indirect one, and not due to the contact of the smoke with the mucous lining of the upper air-passages. Hence, in estimating the influence of the habit on an existing throat-catarrh, the judgment must be based mainly on the evidence of the injurious action of the nicotine absorption, as shown by gastric disturbance or cardiac symptoms.

In addition, it may be said that the fumes of tobacco come in contact, to a very moderate extent, with the mucous membrane beyond the palate, and the only smoke which reached

the parts farther down is that which impregnates the atmosphere which the smoker breathes in common with others near him, or in the same room. Hence, of two persons, one smoking and the other not accustomed to the habit, it is probable that the smoker escapes with the greater impunity from the direct effect of the vitiated atmosphere. I am disposed to regard the habit of chewing as even more vicious than smoking in its effect on the throat, and yet, as a rule, the tobacco chewer does not allow the saliva to reach beyond the mouth, hence it cannot be that its bad effects are the result of direct contact, but are rather due to the indirect effect of the nicotine absorption which must necessarily result from the habit.

Dyspepsia is another condition which has a deleterious influence in markedly aggravating an existing throat catarrh. The intimate sympathy existing between the pharynx and stomach needs no demonstration, as it is a frequent matter of clinical observation; and from whatever cause the gastric trouble may exist, whether from smoking or chewing, or from some of the other numberless causes which give rise to it, it is extremely liable to render prominent and aggravate the pharyngeal affection; and we not unfrequently meet with cases in which the most annoying and distressing throat catarrh is largely due to an existing dyspepsia, and in which relief can only be reached by the treatment of that disease.

Intemperance is another frequent source of the affection under consideration; and here also we find that the habit acts both directly and indirectly. In the majority of cases, probably the troublesome pharyngitis from which those addicted to drinking suffer, is due to the gastritis which so frequently results from the use of alcohol; and yet the direct contact of alcohol with the pharyngeal membrane cannot but exercise the same deleterious influence upon it that it does on the lining of the stomach; hence we find that those accustomed to taking their liquor undiluted, very soon commence to experience trouble in the throat, due partially and largely to the direct impact of the alcohol upon the pharyngeal membrane, and also aggravated by the gastric catarrh which so soon results from this vicious habit.

The quickness of the pharynx to sympathize with morbid conditions in the stomach, is still further illustrated by the fact that a temporary disorder in that organ, such as an attack of

indigestion, will often produce, for the time, a profuse secretion from the faucial mucous membrane, which is only relieved with the relief of the gastric trouble. How far our habits of eating and drinking may have an influence in the causation of a pharyngeal catarrh is perhaps a question; yet that this may be a frequent source of the disorder seems very plausible when we bear in mind how frequently the fauces are subjected to the extremest ranges of temperature in eating and drinking, without any interval of rest; and that, at the same meal, the pain caused by a mouthful of tea or coffee at nearly the boiling-point, is alleviated by taking instantly a drink of water at the freezing-point.

The most frequent, perhaps, of all causes of pharyngeal catarrh is nasal catarrh, involving as it usually does the glands of the upper pharynx. This source of the disease is due partially, perhaps, to the extension of the inflammatory process from above downward, but more probably it is due to the constant secretion which is poured out from above, and passing over the membrane, gives rise to a constant hacking, clearing of the throat, expectorating, and labored efforts to relieve the fauces from the accumulation of mucus, which also must have something of a vicious influence, coating and adhering to the membrane, and interfering with its proper function.

The action of nasal catarrh, in inducing or aggravating an existing pharyngeal catarrh, is still further manifested when the nasal trouble is attended with obstruction which interferes with free nasal respiration. As a consequence of this condition the breathing is carried on through the mouth, hence the pharynx is subjected to the action of a current of air containing little moisture, and is therefore liable to become abnormally dry and parched. This is especially the case during sleep. The result, is either to cause an extension of the morbid condition to the pharynx, or to aggravate that already existing. This part of the subject, will be considered at length when we come to the subject of nasal catarrh, but it should be borne in mind in this connection that of all sources of pharyngeal catarrh the nasal disorder is by far the most frequent.

The pharyngeal catarrh which so frequently accompanies phthisis, chronic bronchitis, asthma, and other pulmonary diseases, is simply an evidence of how a mild pharyngeal trouble is liable to be aggravated by any condition which acts to seri-

ously impair the general health; and furthermore also,, the close sympathy which exists between diseases located in different parts of the respiratory tract.

Examination.—On direct inspection, the mucous membrane of the pharynx will be seen of a dark red, oftentimes verging on a purplish color; this red color, however, is not a uniformly diffused red, but presents a somewhat mottled appearance, the discoloration being more marked in places. It is also covered by small masses of thick, tenacious mucus, which may aid in causing this mottled aspect. This, of course, should be removed before the proper estimate of the character and appearance of the membrane can be reached. Traversing the surface, also, will be seen enlarged and tortuous blood-vessels approaching the superficial layer of the membrane and coursing there for a longer or shorter distance as the case may be, and again dipping into the deep tissues, and disappearing from sight. The surface of the membrane presents a somewhat nodular appearance, that is, it is not a smooth and even surface, but is thickened throughout its whole extent, due as we have seen above to certain hyperplastic changes in the deep layers; these deposits, however, seem to aggregate themselves in localities so as to give the surface of the membrane an irregular outline; this appearance must not be mistaken for enlarged follicles, which stand out far more prominently and distinctly, and are more completely localized into rounded projections than the hypertrophic thickenings of catarrhal disease which are broader and more diffuse. The membrane is coated with a thick, tough, tenacious, opaque secretion, of a whitish color, verging on yellow, and adheres in a thin shreddy layer to the parts and is removed with some difficulty.

Symptoms.—The voice is usually somewhat hoarse and lowered in pitch, partially due to the same causes which impair the voice in acute pharyngitis, that is, the sounding-board function of the pharynx is impaired; but more particularly due to a chronic laryngeal catarrh, which as a rule, accompanies the pharyngeal disease; the control of the voice is impaired; the use of it becomes limited; its register lowered; it tires easily.

Deglutition is probably impaired somewhat by the loss of the pliability of the membrane, also by a certain amount of mechanical interference with the proper action of the muscles.

The pliability of the membrane of course being impaired by its hypertrophy, and also by the fact that it is not coated by the normal thin fluid mucus, but instead by a thick, ropy, semi-fluid discharge. The muscles are somewhat impaired in function, as I believe all muscular structures are liable to be to a certain extent, which lie immediately in contact with, and beneath a membrane in a state of chronic inflammation. There is more or less cough, occasionally, which, however, assumes more of the nature of an attempt to clear the throat, and there is some pain or sense of discomfort about the fauces, the feeling as of a foreign body lodged there, together with a raw, raspish feeling, oftentimes, which becomes a constant source of annoyance and distress; occasionally the feeling is described as feathery, or of a cobweb in the fauces.

There is a more or less profuse secretion of mucus which gives rise to a constant hawking and expectorating; especially is this true in the morning, after hours of sleep, during which the voluntary efforts at clearing the throat have been abolished, while at the same time abnormal secretion has been going on. As the result of this, there is a considerable accumulation in the fauces over night; as the sufferer generally sleeps with his mouth open, the discharge loses much of its moisture, and becomes an extremely thick and tenacious mass, which is only dislodged after more or less violent efforts at hawking and coughing; this performance oftentimes requiring half an hour or even more, which is a time of distress to the sufferer and no less so to those about him.

Treatment.—It requires no especial demonstration to show that an application made to a coating of mucus which covers a diseased mucous membrane, expends its strength in coagulating the mucus, and hence fails largely in exerting any effect on the membrane itself. The first step in treatment then should be the thorough cleansing the parts of the accumulated mucus. For this purpose the following solution from "Dobell on Winter Cough," may be used:

℞. Acidi carbolici..... gr. xij.
Sodæ biborat.,
Sodæ bicarb.....āā gr. xx.
Glycerinæ..... ʒ j.
Aquæ.....ad. ʒ viij.
M.

Occasionally a few drops of ol. bergamot. may be added to disguise the carbolic acid. I know of no better cleansing solution than the above, and for several years I have been accustomed to use it almost exclusively, in not only pharyngeal disease, but in all cases where a cleansing solution is needed. In the absence of the above solution there may be used any of the alkaline solutions; as sodii chlorid., sodæ bicarb., potassæ carbonat., sodæ biborat., gr. xx.—℥ j., to which carbolic or salicylic acid may be added with benefit in the strength of gr. iij.—v. to ℥ j. These may be applied by the atomizer or syringe. Failing to completely remove the mucous accumulations in this manner, they should be detached by means of a pellet of cotton wrapped on a probe, or some similar method.

The parts being cleansed, there should be applied an astringent, preferably by means of an atomizer, for this more thoroughly diffuses the remedy than the brush or sponge. We possess no remedy so efficient in chronic inflammation in the pharynx, of a purely catarrhal character, as nitrate of silver; and yet I know of no remedy that has been misused to such a mischievous extent as this. The mistake usually made is in using the strong solutions; it should never be applied, in a catarrhal affection, of a greater strength than gr. xx.—℥ j., and, as a rule, a five, or ten-grain solution will be found even more efficient. Among other remedies that will be found of value are, in the order of efficiency, zinc chloridi, gr. iij.—x. to ℥ j., zinci. sulphat., gr. x.—xx. to ℥ j., acidi tannici, gr. x.—xl. to ℥ j., alumin. sulphat., gr. x.—xx. to ℥ j. These applications should be made two or three times weekly. If there are enlarged blood-vessels visible on the surface, they should be destroyed, and for this purpose no method in my experience is so efficient as the actual cautery. I am accustomed to use a small iron wire, about No. 20 (see Fig. 70), pointed at its end, which being heated to a red heat is bored into the continuity of the vessel. As the result of this, the vessel disappears in a few hours, and it is almost invariably followed by decided relief. This procedure is absolutely painless, and is far preferable to any other, in my experience.

The remaining features of the treatment have reference to whatever complication may exist, such as nasal or laryngeal catarrh, dyspepsia, etc. These must necessarily be remedied before much can be hoped for in the removal of the pharyn-

geal disease. The same, of course, may be said of any general and debilitating condition of the system. Gargles are of but little benefit, while lozenges and cough mixtures are useless, and even mischievous. The main reliance will be on the vigorous and efficient carrying out of the measures suggested.

Pharyngitis Sicca.

This is a chronic inflammation of the mucous membrane of the pharynx, characterized by a scanty secretion, which drying rapidly upon the surface of the membrane, gives rise to a peculiar dry, parchment-like condition. It will be remembered, in what was said in regard to mucous membranes in general, it was stated that the secretion which was poured out on the surface had its source largely in the glands and follicles, and that among the morbid changes which occur we meet with a condition in which the glandular structures are destroyed. This is the condition which obtains in what we call pharyngitis sicca. As the result of chronic catarrhal inflammation, the new deposit in the deeper meshes of the membrane so far encroaches upon the glandular structures as to destroy their activity, thereby robbing the membrane of that proper supply of mucus by which it is kept in a soft and pliable condition. It may occur early or late in the course of a chronic inflammatory process, it being due rather to the adventitious deposit of the inflammatory product than to the duration of the disease. It is the result of a simple catarrhal inflammation which may assume from the commencement the atrophic or dry form. It is often caused temporarily by breathing an abnormally dry atmosphere, whose passage over the upper air-tract robs the lining membrane of its moisture, and leaves it in a dry and parched condition. The habitual exposure to such influences is liable very soon to develop a permanent dry catarrh.

I have noticed, also, that in certain occupations there is an especial liability to this form of catarrh; viz., among workers in tobacco, house-carpenters, millers, and in general those who habitually breathe an atmosphere rendered impure by containing particles of dry dust. Why this should be so I am unable to explain; it is simply a matter of observation.

Symptoms.—The prominent and characteristic symptoms of

the affection is that of a parched and dry condition of the pharynx, a feeling of a foreign body lodged there, due not to any abnormal collection of mucus, but to the fact that the membrane in this dry condition loses its pliable and elastic character, and opposes itself like a dry, rigid plate to the movements of the parts. Deglutition is somewhat difficult, and to an extent painful, on account of the bolus of food failing to meet with a soft, lubricated passage, but lodging against the dry, harsh membrane and passing it with difficulty. These symptoms, somewhat prominent at all times, are more marked always in the morning, simply from the fact that the fauces have been exposed during the night to the passage of air, and have been unrelieved by the passage of saliva and the acts of eating and drinking which have a tendency to alleviate it somewhat through the day. There is generally something of a cough, which is harsh, dry, and irritating in character, and due to the fact, that, as a rule, the larynx is involved in the catarrhal process.

Examination.—On inspection the membrane of the pharynx presents a glazed, oftentimes glassy appearance, showing no evidence of any moisture upon its surface. Its color is of a deep red, with a tendency to a purplish tint, this discoloration extending to the soft palate, uvula, and pillars of the fauces. There may be more or less secretion coating the surface, dependent somewhat on the chronicity of the disease and the time at which the examination is made. If seen in the morning, the secretion will be noticed adhering closely and tenaciously to the membrane, somewhat shreddy in appearance, and, as a rule, discolored by the impurities of the inspired air which have lodged upon and become incorporated with it. If, as is usually the case, the disease extends to the vault of the pharynx, inspection with a rhinoscopic mirror will show somewhat the same appearance in that portion of the pharynx, viz., an injected appearance of the membrane, some thickening of the glandular tissue, not marked, however, a dry parchment-like condition of the parts, with a plug of thick, viscid, dirty-looking mucus, adhering with tenacity to the membrane, and which is removed with extreme difficulty, the curved forceps being oftentimes necessary to detach and tear it away.

Prognosis.—This is an essentially chronic disease, and oftentimes extremely obstinate in character; still it is very

difficult at times to determine, by appearances alone, how far or how completely the destruction of the glandular structures of the membrane has been accomplished. The proper estimate of the extent to which the process has gone is reached by the clinical history of the case. If the disease has not progressed very far, simple measures for its relief will be effectual. If the disease is one of long standing it will be necessary that the measures resorted to in order to accomplish any permanent good shall be kept up for a long period. As a rule, however, in every case, much relief can be given to all the symptoms.

Treatment.—The object of treatment is to entirely free the membrane of its coating of dry mucus; to open up the orifices of its glands, and to stimulate them into such renewed activity as will enable them to supply the membrane with a sufficient amount of mucus to keep it in a moist and pliable condition, and at the same time to subdue the chronic inflammation of the mucous membrane proper. The first indication of treatment, viz., the cleansing, may be accomplished by one of the solutions given in the appendix; these need to be applied with considerable force, in order to detach the thick coating of viscid mucus. For this purpose nothing is better than the post-nasal syringe shown in Fig. 54, its beak being turned downward in such a way that the solution falls directly upon the membrane. If the disease extends to the vault of the pharynx, the beak of the instrument should be turned up behind the soft palate, and those parts washed with the solution; this proceeding should be repeated until the parts are seen to be thoroughly cleansed.

If this is not accomplished by the syringe it will be necessary oftentimes to use the probe wrapped with cotton, to peel off as it were the adherent mucus, or else, as is oftentimes necessary, to remove it with the forceps. This same procedure made use of to cleanse the mucous membrane, serves the purpose also of opening up the mouths of the follicles. These measures having been accomplished, the next indication is the application of such remedies as have the effect of stimulating the glands and follicles into a more copious secretion of mucus. This stimulation of course excites an excessive discharge, but the result of it is permanent good to the membrane, in that it opens up more thoroughly the orifices of the glands and folli-

cles, that it removes the imprisoned débris, and excites a discharge which carries with it a large amount of worn out epithelium, and other irritant matter which has accumulated in the meshes of the membrane, and in the glands, cleaning it out as it were, and leaving it in a condition for the better performance of its proper function. The excessive discharge that is excited by the stimulating applications is but temporary, and, quickly subsiding, leaves behind it a condition of the mucous membrane, as regards secretion, which for the time being is normal and healthy; and which, persisting for a longer time after each course of treatment, finally may become a permanent condition of health. Among the prominent remedies which possess stimulating properties, as topical agents, may be mentioned, sanguinaria, galanga, creosote, potassii bromid., benzoin, myrrh, belladonna, iodine, etc. Of these I regard the sanguinaria as one of the best remedies we possess in dry catarrh. It should be used by preference in the form of the powder; an additional permanency of action being secured by its use in this form. Used alone it is too painful and therefore should be reduced by incorporating it with some other agent as:

℞. Pulv. sanguinaria ..... ʒ j.
Pulv. amyli ..... ʒ iij.
M.

℞. Pulv. sanguinaria ..... ℈ ij.
Pulv. myrrh,
Lycopodii ..... āā ʒ j.
M.

If used in the spray, in the form of the tincture, it should be reduced about one-half.

Galanga only came to my notice in dry catarrh a short time ago, but as far as I have used it I have been much impressed with its efficacy. In several patients on whom I have used both galanga and sanguinaria, the former seemed the more efficacious. This drug may be used pure, in the form of the powder. Of the other remedies alluded to, they possess undoubtedly valuable properties, and should be used in case of failure to remove the affection by means of the first remedies suggested.

In the form of powder, belladonna will often prove useful as follows:

℞. Pulv. belladonna..... ʒ j.
Lycopodii..... ʒ vij.
M.

In the form of spray it may be used of the strength of ʒ ss. —ʒ j. to ℥ j. The potass. bromid. may be used in the saturated solution, ʒ ij. to ℥ j. Myrrh is feebly stimulating, and may be used pure.

These powders should be applied by the powder-blower shown in Fig. 47, and only sufficient thrown on to form a thin film over the parts.

In addition to local applications, such general remedies should be given as may be indicated, and especially is it of importance that the sufferer so guard his manner of life that he may not be exposed to such surroundings as may aggravate his disease.

Elongated Uvula.

As the result of repeated attacks of sore throat, or as a chronic affection from the beginning, we often meet with a condition of the uvula, in which its normal size is increased to such an extent that its free end rests upon the base of the tongue. This increase in size is due mainly to hypertrophy or interstitial deposit in the mucous membrane covering it. There may be, however, hypertrophy of the muscular tissue also. This hypertrophy results in a marked increase in the length of the uvula, and also in its breadth and thickness. Lying then upon the base of the tongue, it gives rise to certain symptoms which are oftentimes of an extremely distressing character. There is a sense of tickling or irritation of the throat, with a feeling as of a foreign body lying there, which excites a constant effort to get rid of it by hemming or hawking. Cough is often present, and not infrequently of an extremely persistent and distressing character. It is a short, barking cough, oftentimes with a hoarse, metallic ring. Upon lying down, the uvula falling backward touches and irritates a more sensitive portion of the fauces, and all the symptoms are somewhat aggravated. If there is very marked elongation there may be excited attacks of spasm

of the glottis. There may be certain reflex symptoms of a spasmodic character excited, due not so much to the hypertrophy as to the temperament of the patient; and, whereas, in one case, an extreme degree of elongation may excite simply a moderate amount of irritation, in another case a moderate degree of elongation may excite attacks of suffocation more or less severe in character or, as I have seen in more than one case, genuine attacks of spasmodic asthma.

Examination.—A simple inspection of the fauces, with the tongue well depressed, reveals the trouble. The uvula will be seen of a deep red color, club-shaped in appearance, with its free end resting upon the tongue. It is generally more or less congested, with a somewhat humid and watery appearance about its border and lower end. It is only by extreme depression of the tongue oftentimes, or by exciting the movements of retching, in which the palate is drawn up, and of course the uvula with it, that the whole length of the enlarged organ can be seen.

The uvula may be somewhat enlarged in an attack of ordinary sore throat, but rarely, if ever, to the extent of producing any symptoms due to the elongated uvula alone, unless there previously existed a chronic elongation; in other words, an elongated uvula is an essentially chronic affection, and that condition which is ordinarily regarded as an acute elongation of the uvula should be regarded rather as an acute pharyngitis, in which the uvula becomes somewhat œdematous, and thereby enlarged. This is the disease in which patients complain that "the palate is down," and present themselves to the physician to have it "raised." It is an ancient tradition, that this can be accomplished by lifting the body by a tuft of hair on top of the head, and it, undoubtedly, may do good by its moral effect.

Treatment.—The local treatment of the so-called acute affection is that of acute pharyngitis, and consists in the application, by means of sprays or gargles, of a mild astringent, as, ferric alum, ferri persulph., tannin, alum, zinci sulphat., etc., in the strength of gr. x.—xx. to ℥ j.

In the true hypertrophied uvula local applications are of somewhat doubtful efficacy; if, though the increase in size is moderate in extent, benefit may be derived by applying by the brush glycerole of tannin, ferric alum, gr. xx.—℥ j., tr. iodini, ℥ ij.—℥ j., etc., as a rule, however, the only resource is in re-

moving the redundant portion of the organ. For this purpose special instruments have been devised, as the ordinary uvula scissors (Fig. 70) or Sayre's uvulatome (Fig. 71), constructed on the principle of the guillotine. Elsberg's instrument (Fig. 72) is on a similar principle. All these devices are objectionable as complicating an extremely simple operation. And, furthermore, if it is attempted to cut the uvula with one of these instruments, without first seizing the organ with a pair of forceps, it

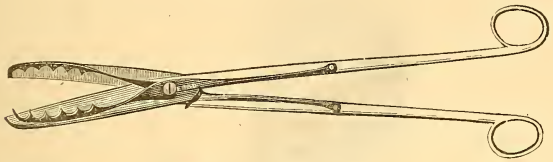

Fig. 70.—Ordinary uvula scissors.

will be found almost impossible, for the palate is not controllable ordinarily by the will, and upon the slightest touch it is retracted, and the seizure of the uvula rendered extremely difficult. The simplest, safest, and easiest method of operating is to seize the extreme end of the uvula with a pair of slender forceps, and drawing it forward, to remove the redundant portion by an ordinary pair of scissors. The use of the forceps is indis-

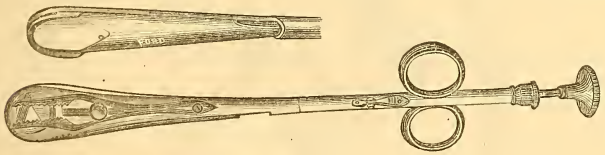

Fig. 71.—Sayre's uvulatome.
Fig. 72.—Elsberg's uvulatome.

pensable, as it is only by this procedure that the retraction of the palate can be prevented.

In cutting through the organ the direction of the scissors should be upward and backward; in this manner a cut surface is formed which is mainly on the posterior face of the organ. Hence, when food is taken, the palate and uvula being drawn back, the wound lies against the wall of the pharynx, while the bolus of food passes over the anterior face of the

uvula, and the raw surface escapes contact from what might prove a source of extreme pain and irritation. (See Fig. 73.) After the operation the hemorrhage is slight, as a rule, and the wound heals kindly in the course of a few days or a week;

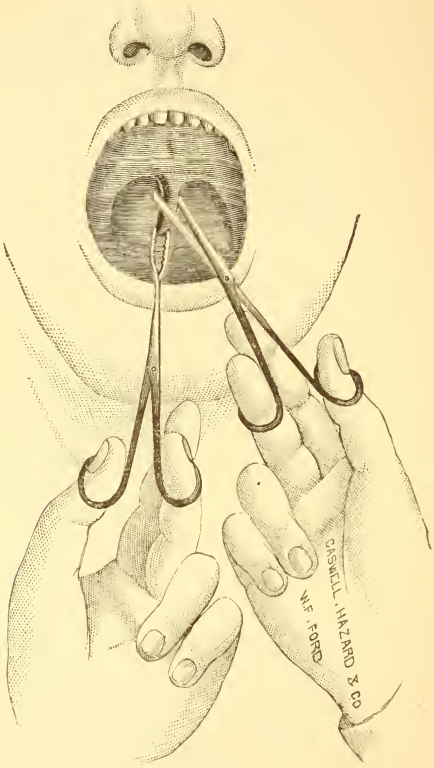

Fig. 73.—Cutting the uvula.

but during this time the patient is liable to suffer not a little from the soreness in the organ. This will be less, however, if the cutting is done as suggested above. In addition, it should be suggested, a patient should avoid eating and drinking for as long a time as possible after the operation, thus enabling the

wound to heal as far as possible before it is subjected to the irritant action that may be in the food taken.

Nothing whatever should be applied to the cut unless it is rendered absolutely necessary by hemorrhage, as any application will only irritate the surface and delay the healing of the wound. The whole of the uvula should never be removed, but only the redundant portion; and there should be left behind a fair-sized organ. In the act of swallowing the soft palate is drawn up against the pharyngeal wall, and the uvula fitting in the angle formed by the two sides, completes the closure of the opening between the pharynx and nose, thus preventing the escape of food into the nasal cavity during the act; the complete removal of the uvula, therefore, may impair this function.

CHAPTER VI.

CROUPOUS OR EXUDATIVE AFFECTIONS OF THE PHARYNX.

Acute Follicular Pharyngitis.

This is an acute inflammation in the mucous membrane of the pharynx, in which the force of the disease expends itself mainly upon the glandular structures and manifests itself by a fibrinous exudation into the follicles or glands. As a rule, in this affection, scattered groups only here and there are involved. The causes of the disease, as far as we know, are entirely comprehended in the one single cause of taking cold.

Course and symptoms.—As in all diseases of the mucous membranes characterized by a fibrinous exudation, the onset of the attack is marked by a chill or decided chilly sensations, followed by fever more or less active in character, the temperature often reaching as high as 102° or 103°. This is soon followed by pain, referable to some portion of the throat, of a smarting, burning character, and sense of uneasiness, with the symptom always prominent of extreme pain in swallowing. This pain is due to the pressure caused by that act upon the inflamed and distended follicles. There is often a parched, dry feeling in the throat and very rarely any excess of mucus secretion. The glands of the neck are occasionally affected, showing themselves in little enlarged granules or knots directly opposite the diseased portion.

Examination.—On direct inspection of the fauces the mucous membrane proper may be seen to be somewhat reddened and congested, or it may show such slight evidences of disease that it may be oftentimes extremely difficult to locate nicely or with exactness the source of the trouble. The glands or the follicles of the pharynx group themselves along the posterior pillars of the fauces, forming a chain which ex-

tends down low into the pyriform sinuses; we also find a group of glands extending down from the upper pharynx below the border of the soft palate. As a rule it is one of these groups that is affected. The attack is generally confined to a single group, and it is only by the closest inspection, by direct vision, or by the use of the mirror, that the diseased part can be detected. When found, however, there will be seen a little irregular mass, with a somewhat nodulated outline projecting above the surface of the mucous membrane; broad, red in color, and showing at the apex of each nodule a bluish-white spot which is the fibrinous exudation into the follicle showing through the thin layer of membrane which covers and conceals it. If the diseased part is not easily recognized by the mirror, the probe serves oftentimes to localize the trouble; for in passing it down to the spot its exquisite tenderness is revealed.

Treatment.—This is something more than a purely local disease; there is probably a blood condition which so far dominates the inflammatory process as to change it from a simple catarrhal inflammation to one characterized by an exudation of lymph; this is shown by the prominence of the constitutional symptoms; the chill, with the subsequent fever, being something more than would be expected, as merely a symptom of so small an extent of local inflammation. Hence it is of importance that the general condition should be corrected by the administration of internal remedies. The remedy which seems to meet the condition better than any other is quinine, given, for an adult, in doses of from five to ten grains repeated twice a day. In addition to this there should be given tincture of iron as in the following prescription:

℞. Tinct. ferri ..... ʒ iij.
Glycerinæ ..... ad. ʒ ij.
M. Dose, one teaspoonful every two hours.

Local treatment.—I have fallen into something of a routine practice of applying to all acute inflammations of the follicles, locally, a forty-grain solution of nitrate of silver; confining the application as nearly as possible to the diseased part, using either the sponge, or probe wrapped with cotton. This application is invariably followed by relief to the subjective

symptoms, which are oftentimes extremely painful and distressing. This application it may be necessary to repeat the following day, but as a rule the single application will prove sufficient, in connection with the iron and glycerine, which seems to exert an almost specific influence in controlling and relieving an attack of acute follicular inflammation. This is due probably, in part, to the local effect of the iron coming in contact with the diseased surface in the act of swallowing, but more I think to the effect of its internal administration in controlling the blood condition which gives rise to the fibrinous character of the exudation.

Chronic Follicular Pharyngitis.

This is one of those affections which, owing to its essentially chronic character and its intractability, has been regarded as almost incurable ; this is due to many causes. As a rule it commences in a simple catarrhal sore throat, which being allowed to take its own course subsides, leaving behind it so slight a morbid condition of the membrane as to be unnoticeable. Subsequent attacks recur with more and more frequency, and subsiding less thoroughly, there finally results a condition of chronic pharyngitis which becomes a permanent source of discomfort. The follicles of the membrane very soon yield to the consequent irritation of the catarrhal condition and become centres of localized inflammatory processes of a chronic character. We have then occurring in the scattered glands and follicles the same changes which occur in the tonsils when in a state of chronic inflammation or hypertrophy ; only in the one case there is a large number of glands aggregated to such an extent as to constitute a separate organ, while in the other the glands are scattered and diffused over a broad surface. This chronic inflammation results in the development of small masses of glandular tissue in a state of hypertrophy ; this hypertrophy consisting of connective tissue, enlarged blood-vessels, and epithelial elements, together with retained secretions which have undergone degeneration, the whole constituting little nodules standing out prominently on the surface of the membrane, or little aggregations of follicles which act as local irritants, and give rise to certain subjective symptoms to be described. This process of chronic inflammation setting in almost imperceptibly

bly, as has been stated, progressing from bad to worse by its own impetus, is also subjected to certain aggravating surroundings and influences; occurrences and incidents which the sufferer would have met with impunity before, now become the cause of marked exacerbations in his troubles; he becomes especially sensitive to changes of temperature; and the prolonged use of the voice, breathing of an impure atmosphere, and circumstances of this nature become the causes of renewed attacks of acute trouble, or of an aggravation of the chronic symptoms. In the early stages of the disease the patient is simply conscious of a certain amount of discomfort in the throat; perhaps a mere dryness of the fauces, with difficulty of swallowing, due to loss of pliability of the membrane; or a sense of a foreign body in the throat followed soon, perhaps, by a slight excess of secretion, with a tendency to expectorate, and some little disposition to cough. As the disease progresses the voice becomes impaired and weakened; this is due to a chronic laryngeal catarrh, which almost invariably accompanies the later stages of the disease; there is hoarseness, with more or less cough, with impairment of voice register. The disease has been called clergymen's sore throat, though it is by no means certain that clergymen are more liable to it than others; but of course with those to whom the use of the voice is so important, the impairment of this organ becomes a somewhat serious matter; and again, the constant use of the voice to which clergymen necessarily are compelled, serves to aggravate the symptoms. In addition to the hawking, expectoration, and cough resulting from the excess of secretion from the lower pharynx, there is, as a rule, more or less abnormal discharge from the glands at the vault of the pharynx, due to the fact that these glands are liable to become involved, by an extension to them, of the inflammatory process which has fixed itself upon the parts below. This is not true of every particular case of follicular pharyngitis, but it is true, probably, of a very large proportion; so that in addition to the above-mentioned symptoms, we have a thick, viscid mucus poured out from this source, and flowing down between the palate and pharynx, lodges there with considerable tenacity, and is only removed by a disagreeable nasal screatus and drawn down into the pharynx below, where it is hawked out or swallowed. The pain in the pharynx is usually described by patients as a rasping, raw, scraping feeling; this

is due partially to the pressure on the nerves by the enlarged follicles, and partially to irritation resulting from the labored effort and the constant hawking by which the throat is cleared of the accumulated mucus. In addition to this there is more or less neuralgic pain referable to the throat and neck. This is probably due to the involvement of the terminal filaments of the nerves. The lymphatic glands of the neck are often involved, being noticeably somewhat enlarged and swollen. The closed follicles in the deep layers of the mucous membrane are also involved, probably, in this disease. These follicles anatomically and physiologically are connected with the general lymphatic system. What connection really exists it is not known, but

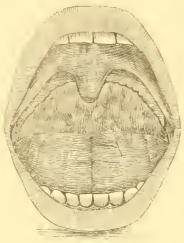

FIG. 74.—Follicular pharyngitis. (Cohen.)

FIG. 75.—Follicular pharyngitis in an aggravated form. (Cohen.)

that there is a direct connection through the lymphatic channels with the cervical ganglia is probable. This connection is demonstrated as a clinical fact repeatedly, and for the present we may simply explain the fact that the cervical glands are enlarged in chronic follicular pharyngitis by the analogous and probable direct anatomical connection between them and the closed follicles of the pharyngeal membrane.

Inspection.—On examination of the parts, the prominent and first thing noticeable is that of a number of rounded projections on the surface of membrane of the lower pharynx, from the size of millet-seeds to that of a small shot. (Figs. 74 and 75.) These are more prominent, and more thickly distributed along the pillars of the fauces and opposite the lower border of the

soft palate. They are of a dark red color, with a tendency to a purplish hue; and lie upon a mucous membrane which is itself of a much darker shade than the normal.

Occasionally there may be seen, at the summit of these prominences, the opening into the crypts of the hypertrophied follicles of which they are composed; and not unfrequently protruding from them, masses of cheesy matter, the result of retained and decomposed mucus; though, as a rule, the follicles contain no cavity, this being destroyed by the encroachments of the newly deposited connective tissue, which has destroyed their glandular character. These masses are not infrequently voided in the shape of small, rounded, hardened lumps, which upon being broken give forth a most intolerable stench.

Treatment.—The membrane is covered with a thick, shreddy, tenacious mucus, which is closely adherent, and removed with some difficulty, hence the first measure should be the thoroughly cleansing of the membrane by the removal of this accumulation. For this purpose one of the cleansing solutions given in the appendix should be used, preference being given to the first. The best method of applying this is by means of the compressed air-apparatus with Sass's tubes, the atomized fluid being showered upon the part with a pressure of from fifteen to eighteen pounds.

The force with which the jet is thrown aids the solvent action of the fluid, and serves to thoroughly accomplish the desired purpose. Richardson's hand-ball spray-apparatus, Fig. 61, or the little atomizer, Fig. 63, answer a good purpose. The same end may be obtained by the use of the post-nasal syringe, Fig. 54, the beak being turned downward over the root of the tongue. Occasionally it will be necessary to resort to the sponge, or a pellet of cotton wrapped on a probe, to detach the closely adherent shreds of mucus. It is only after this thorough cleansing that a proper appreciation of the condition of the membrane will be attained, yet it should always be borne in mind that the result of any application to the mucous membrane is a temporary, but marked congestion of the parts, giving rise to increased redness and some slight swelling. After the parts are thoroughly cleansed measures for the correction of the morbid condition should be resorted to. In the early stages of the affection, before it becomes an essentially chronic one, or the follicles markedly enlarged, simple local

applications are sufficient; of these, in order of preference, may be used argenti nitras, gr. v.—ʒ j., zinci chlorid., gr. v.—x. to ʒ j. bichloride of mercury, gr. j.—ʒ j. In these applications advantage is taken not only of their astringent action, but also of their resolvent power. They may be applied by means of the spray or brush, the tongue being well depressed, and the whole pharyngeal wall exposed. If the affection has existed for some time, local applications are of but limited benefit, and the only method of relief will be in the complete destruction of the enlarged follicles. For this purpose I know of nothing better than the actual cautery. It is almost painless at the time of the application, gives rise to no subsequent annoyance, and is quite efficient. A small wire heated to a red heat is applied directly to the enlarged follicle, and is pressed into its substance until it has burned its way to its base. As the result of a single application generally, the follicle is completely destroyed; a slough

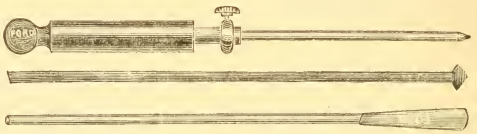

Fig. 76.—Actual cautery wires for the destruction of enlarged follicles in the pharynx.

forms, which separates in a few days, leaving a small cavity which heals kindly. For this purpose I have had constructed a set of small wires, Fig. 76, with their points fashioned to adapt them for the destruction of follicular enlargements of varying shapes and sizes. Occasionally I have resorted to the use of the knife, making a free incision directly through the mass of the enlarged follicle, and cauterizing the cut surface with a solid stick of nitrate of silver. This procedure is an efficient one, but somewhat painful; the use of the cautery is preferable. The use of chromic acid, Vienna paste, caustic potash, and the galvano-cautery has been advised; they possess no advantages over the methods suggested, and many disadvantages. Destruction of the afferent blood-vessels has been recommended, on the ground that this procedure will lead to the atrophy of the enlarged follicle; the destruction of the follicle itself is quite as simple a procedure; and, moreover, it is not possible to localize the blood-vessel which supplies the enlarged gland,

comparatively few of them showing on the surface; and again, I am disposed to think that these large blood-vessels are more frequently seen in chronic catarrhal pharyngitis than in the follicular disease. If, as is usually the case, the larynx be affected, the voice should be given as near absolute rest as is attainable; this not only for the direct injurious effect of using the voice on the disease of the laryngeal membrane, but for its indirect injury to the pharynx. This, of course, in a clergyman, or one whose occupation involves an amount of public speaking, can only be obtained by the abandonment for a time of the occupation. This should nevertheless be insisted upon, else it will soon be forced upon the sufferer by the exigencies of his infirmities, rather than by the advice of his physician. Any impairment of the general health must be corrected by such measures as are especially indicated, and which need not here be enumerated. The cough which oftentimes accompanies the disease may be of such an annoying and harassing character as to demand relief.

As a rule, the ordinary anodyne cough-mixtures should be avoided, as indirectly exercising an injurious effect upon the original disease, in that their tendency is to impair the digestive function. There are two remedies which exercise a direct and almost specific influence on the mucous membrane of the throat; these are cubebs and ammonia. Just how this influence is exercised is not known, but probably in each case the action is somewhat similar, in that, being taken into the general system and absorbed by the blood, the volatile element of the drug is eliminated to a degree through the mucous membrane of the upper air-passages. In the case of ammonia, in whatever form the drug is taken, it is in part converted into the carbonate, and in this form is eliminated. Cubebs on the other hand contains the volatile element, cubebic acid, which, when taken into the system, is also eliminated through the upper air-passages. The best method of administration of the ammonia for the relief of cough and the symptoms of follicular sore throat, is in the form of the muriate and in lozenges. In this manner there is obtained both a local and general effect of the drug. Its local effect is stimulating; whereby, coming in contact with the membrane it excites it to a somewhat freer secretion, relieving it of its coat of thick tenacious mucus, relieving the epithelial coating of the membrane, choked as it is usu-

ally, relieving the engorged blood-vessels somewhat, and thus, by a process of local depletion, as it were, relieving the prominent subjective symptoms for a time. This action is further increased by the escape through the membrane of a portion of the ammonia which has been taken into the system; its action in this manner being somewhat similar to that which results from its direct contact with the diseased surface in deglutition; it stimulates the membrane to a somewhat freer secretion, causing it to supply a larger amount of moisture to the mucus, thus loosening the cough. Cubebs should be administered by preference in the form of a powder prepared freshly and from the fresh new berry; the object of this being, that the drug should contain as largely as possible of the cubebic acid which is its efficient constituent. Its action, like that of ammonia, is due partially to its local effect, and partially to the action of the passage of the cubebic acid through the membrane in the upper air-passages in its elimination. It exercises a certain stimulating effect on the membrane, followed almost immediately by a sedative action, whereby relief is given to the sense of soreness or rawness of the throat, the deglutition, and disposition to cough. These drugs may be administered separately, or they may be combined with benefit, as in the following:

℞. Pulv. cubebæ..... ʒ iij.
Syr. aurant. cort.....ad. ℥ ij.
M. Dose, one teaspoonful.

℞. Mur. ammoniæ..... ʒ ijss.
Syr. tolu,
Aquæ.....āā ℥ j.
M. Dose, one teaspoonful.

℞. Fl. ext. cubebæ,
Mur. ammoniæ.....āā ʒ ij.
Elixir simpl..... ℥ ij.
M. Dose, one teaspoonful.

℞. Potass. chlorat.,
Pulv. cubebæ,
Sacch. alb.....āā ℥ j.
M. Taken on the tongue, *ad lib.*

Occasionally relief will be obtained from chewing the dry cubeb-berry. In this way the drug is used in a form in which it contains its volatile element in the largest amount.

As regards other indications for treatment, it may be simply noted that any impairment of the general health should be remedied by proper remedies; and any tendencies or existing diathesis corrected as far as possible.

Membranous Sore Throat or Croupous Pharyngitis.

This consists of an acute inflammation of the mucous lining of the pharynx, characterized by the exudation of a fibrinous material that coagulates upon the surface of the membrane, forming a grayish, pearl-colored pellicle which is oftentimes mistaken for diphtheria. The favorite site of this exudation is on the surface of the tonsil, though it may extend somewhat to the soft palate and pillars of the fauces. As a rule it is confined to one side, though occasionally it appears on both sides; if this be the case, however, the deposit is usually greater on one than the other. It is not contagious or infectious, it runs a somewhat limited course and its tendency is always to get well. As has been said before, there is probably some antecedent condition of the blood, which so far dominates and controls the inflammatory process as to lead to a deposit or exudation instead of a simple catarrhal affection which would ordinarily result from catching cold, this being, as far as we know, the usual and prominent cause of the trouble. What this antecedent condition is it is not easy to say, but it is probable that it is analogous or similar to what we know as hyperinosis, viz., that condition of the blood in which there is an excess of fibrin. As a result of this condition, we find that the disease is ushered in by a chill, followed by high fever, which is more marked than we should ordinarily expect to find in connection with or symptomatic of an inflammatory affection of so limited extent. The febrile motion we must therefore attribute to the blood condition and regard the affection as something in the nature of an essential fever with a local manifestation. This chill may be a well-marked chill or simple chilly sensations followed by more or less prominent general symptoms, such as pains in the bones, headache, and

general malaise. The fever sets in very soon, and is marked by a temperature ranging from 101° to 103°.

In connection with the fever, the symptoms referable to the throat become prominent; there is a parched, hot feeling, with pain of a somewhat lancinating character, referable to the fauces, together with soreness and stiffness about the jaws. Deglutition becomes extremely painful, due probably to the fact that the glands and follicles are involved in the inflammation. The lymphatic glands of the neck are somewhat swollen, though to a very slight extent, as a rule. Occurring, as this disease does, more frequently in children than in adults, the symptoms are oftentimes of an extremely alarming character. This alarm is very much increased by the discovery on inspection, of the patch in the throat, which is so inseparably connected in the minds of the laity with diphtheria; it is greatly enhanced also by the aggravated form, which the febrile movement generally assumes. It therefore becomes of no little importance to recognize membranous sore throat as a disease separate and distinct from diphtheria, and also, of course, to make an unmistaken diagnosis. This can be done with almost absolute certainty in most cases, the diseases presenting certain characteristics which render them unmistakable.

On examination of the fauces in membranous sore throat, we find the whole mucous membrane of the pharynx involved in a state of active and acute catarrhal inflammation; the membrane is reddened, and of a bright, almost scarlet color, this discoloration and injection extending somewhat to the pillars of the fauces, the palate, and uvula. The tonsils are somewhat thickened and raised from their bed, and present on the surface of one or both a whitish-gray membrane with a bluish or pearly tint. The mucous membrane surrounding the patch presents no marked areola of redness, but it is of the same color as that of the membrane of the whole fauces as far as the catarrhal inflammation extends. The edges of the membrane are well defined and rounded. The patch presents all the appearance of a live membrane, in distinction from the membrane in diphtheria, which is a dead membrane or necrosed tissue. The patch is somewhat limited in extent and confined to the surface of the tonsil; very rarely it may extend on to the pillars of the fauces or soft palate, and occasionally to the pharyngeal wall. This

tendency to extension, however, is extremely limited. The membrane in the earlier stages is soft and friable, and easily wiped off, breaking up into soft bran-like particles. In the later stages, when the membrane is fully organized, it is still easily removed, and is torn off in a thin pellicle, showing that it is deposited on the surface of the membrane, which is characteristic of croupous exudation, in contradistinction to the diphtheritic exudation, which involves the whole thickness of the mucous membrane.

The distinctive differences between the exudation of membranous sore throat and that of diphtheria will be more clearly appreciated by placing them in a tabular form.

Membranous Sore Throat.	*Diphtheria.*
A grayish-white, pearly membrane.	A dead white, opaque membrane, with a blackish tinge resembling boiled macaroni.
All the appearances of a living membrane.	All the appearances of a necrosed membrane.
No areola.	More or less marked areola.
Rounded, well defined edges.	Edges ragged and somewhat everted.
Feebly attached to the parts beneath.	Firmly attached to the parts beneath.
Easily removed without bleeding.	Only detached by violence, resulting in hemorrhage.

Treatment.—From what has been said, it will be seen that the disease under consideration is largely a systemic disease with a local manifestation ; hence a prominent indication for treatment lies in the correction of the blood condition. For this purpose quinine should be given, and freely. From ten to fifteen grains should be given to an adult, and smaller doses in proportion to children. This should be repeated, if necessary, at the end of twelve hours, according to the amount of febrile movement still remaining, If there is much pain, headache, or soreness about the jaws, with difficulty in swallowing, a small amount of Dover's powder may be added to the quinine. Aconite also serves to promote resolution, and to exercise a special influence on the fauces ; it should be given in doses of from half a drop to one drop every hour. The local treatment involves the complete removal or destruction of the membrane. In the earlier stages this should be wiped off or detached as thoroughly as possible, and the site painted with a solution of ni-

trate of silver, ʒ j.— ℥ j. This, as a rule, not only prevents its reproduction but relieves the pain. If there is much acute pharyngitis accompanying the attack it may be treated by simple astringent sprays or gargles. Iced or acidulated drinks may be given freely, or pellets of ice may be allowed to melt in the mouth or rest against the inflamed fauces with comfort and relief.

CHAPTER VII.

ACUTE AFFECTIONS OF THE TONSILS.

General Considerations.—In describing the general construction of mucous membranes, it was stated that they are largely endowed with glands and follicles which show a tendency to group themselves in certain localities, as in the vault of the pharynx and between the pillars of the fauces. The group between the pillars of the fauces is so extensive as to constitute it an independent organ, under the name of the tonsil. These glands are two almond-shaped bodies, made up of a number of compound follicular glands, whose orifices, uniting with each other, open on the free surface of the membrane by about fifteen or twenty openings. These follicles are simply infoldings of the mucous membrane, by which a flask-like cavity is formed, lined with a thin layer of glandular epithelium. The outer wall of the glands is formed by a layer of connective tissue, together with a delicate fibrillary vascular layer. In this layer we find imbedded a number of closed follicles, containing a large number of cells and free nuclei lying in a clear fluid. The tonsils are in relation externally to the superior constrictor muscles of the pharynx, internally with the carotid and ascending pharyngeal arteries, and lie opposite the angle of the jaw. The arterial supply, which is very abundant, is derived from the dorsalis linguæ branch of the lingual, the descending palatine and tonsillar branches of the facial, the ascending pharyngeal branch of the external carotid, and the descending palatine branch of the external maxillary arteries. The veins empty into the tonsillar plexus, on the side of the tonsil. The nerve supply is from the fifth pair and the glossopharyngeal nerve.

The function of the tonsil is probably twofold. Its secretion is derived from the follicular glands of which it is largely composed, and also from the closed follicles in the deep layer,

which also pour out or supply, either by the rupture and escape of their contents or by transudation, a clear viscid fluid containing cells and nuclei. This secretion is poured out upon the bolus of the food as it passes the isthmus of the fauces, and facilitates its progress into the œsophagus. The existence of the closed follicles in the deep layers of the connective tissue entitle the tonsil to be regarded as one of the ductless or blood-glands, which are very nearly allied to the lymphatic glands. These follicles play the same part in the economy as in other analogous glands, viz., by producing some change in the constituents of the blood.

The affections which we meet with in the tonsils are *acute tonsillitis* or *quinsy sore throat*, *subacute tonsillitis*, *acute follicular tonsillitis*, and *chronic tonsillitis* or *hypertrophy of the tonsils*. These diseases only will be considered for the present, although other affections are met with occasionally, such as tumors, chalky concretions, epithelioma, carcinoma, and gangrene. These, however, are diseases frequently met with in all parts of the body, and when making their appearance in the tonsil present no characteristics which are peculiar, and give rise to no symptoms that are unique, but obey the same rules which govern them wherever they occur. The affections of the tonsil in diphtheria, small-pox, scarlet fever, and measles being merely symptomatic, and not essential diseases, their consideration properly belongs to treatises on the general diseases which give rise to these conditions.

Acute Tonsillitis, or Phlegmonous Tonsillitis.

In the confusion of our medical nomenclature we find this disease laden with a large number of names, such as phlegmonous sore throat, cynanche tonsillaris, angina faucium, amygdalitis, and quinsy, a simple corruption of the Latin term cynanche. We adopt the term acute tonsillitis, as best defining the disease under consideration. It is an acute phlegmonous inflammation attacking the fauces, in which the tonsil is the starting-point of the inflammatory process, and bears the brunt of the disease, but also involving the mucous membrane and cellular tissue of the parts adjacent. It is characterized by marked swelling and infiltration of the parts, with a decided

tendency to suppuration and the formation of an abscess; there is increased secretion, with more or less constitutional disturbance. As to the causes of this affection very little more can be said than that the prominent exciting cause is exposure to cold, and that the most frequent predisposing cause is a previous attack. It is generally asserted that persons of a strumous habit are peculiarly liable to quinsy sore throat, yet we find that it occurs in the healthy and robust with even more frequency than in those of the strumous habit. Again, it is said that persons in ill-health from any cause are liable to attacks, yet we frequently meet with those in the enjoyment of perfect health who are attacked with this affection under very slight provocation. As to age, it is more common in children and young persons than in adults. This is probably due to the greater frequency with which we meet with enlarged tonsils in children. It is more frequent in men than in women, owing to the greater exposure to cold to which men are subject. The existence of a chronic enlargement of the tonsils is unquestionably a prominent predisposing cause.

Symptoms.—It is generally ushered in by a chill more or less well marked, followed by general febrile movement. At times its onset is marked by merely chilly sensations. The febrile movement is attended with the ordinary phenomena of symptomatic fever, viz., headache, pains in the limbs, full pulse, and hot skin, the temperature oftentimes reaching 102° to 103°. Following very soon upon these symptoms, the patient commences to experience some dryness, with a sense of uneasiness in the throat, the secretion from the mucous membrane at the onset of the affection being diminished. This is soon followed by acute pain, shooting toward the ears with each attempt at swallowing: these symptoms becoming rapidly aggravated, each attempt at deglutition is attended with such increasing pain, that the features are convulsively contracted by the act, and the sufferer soon becomes unwilling to make the attempt. The movements of the jaw become so painful and restricted that the opening of the mouth is rendered almost impossible; the breath becomes offensive, emitting a sour, fetid odor, and the glands of the neck enlarged and hardened. The neck itself becomes swollen and stiff, and there is more or less difficulty of breathing, owing to the mechanical interference with the free ingress of air. As the result of the febrile

movement, the difficulty of breathing, and the increasing pain in the fauces and neck, sleep becomes difficult or impossible. Deglutition is not only painful, but the food is regurgitated into the mouth or nasal passages; this is due to the fact that the muscles of the fauces are paralyzed, and fail to perform their proper function of closing up the naso-pharyngeal and oro-pharyngeal opening, in the act of deglutition. This paralysis is explained as follows: In the severe forms of inflammatory disease, such as we are dealing with, there is a certain amount of serous exudation beneath the membrane, which extends to and involves the muscular structures, thus infiltrating them in such a manner that their contraction is seriously interfered with; in fact, they are paralyzed, and fail to perform their special duty in deglutition. If the inflammation has extended into the pharynx, the constrictor muscles of the pharynx are liable to become paralyzed in the same manner, and the difficulty in swallowing, of course, becomes greatly aggravated. If now, in this condition, the attempt is made to take food and the bolus has passed into the pharynx, the patient can pass it neither forward nor backward, and his condition becomes an extremely alarming one; for if in this dilemma he attempts to breathe, there is danger of the mass passing into the larynx, and indeed this is not an unfrequent occurrence. The secretion of saliva is also stimulated and greatly increased, only to add to the misery and discomfort of the sufferer, for being unable to swallow or expectorate, he is compelled to sit with his head bent forward to allow it to trickle from his mouth. At this stage of the disease he presents a typical picture of suffering and despair; he refuses alike food and medicine, on account of the exquisite pain caused by the mere attempt to swallow, made as it is with his face resting on his hands and his elbows on his knees, the head bent forward and the mouth open to allow the mucus and saliva to escape without involving the painful effort of hacking or clearing the throat. The voice is early affected, and changes in character, becoming muffled and thick, and loses entirely its nasal tone. Deafness is oftentimes a symptom, the enlarged tonsils pressing upon and closing the orifices of the Eustachian tubes.

On examination, if the mouth can be opened sufficiently to allow of it, there will be seen bulging forward a large rounded tumefaction, displacing not only the tonsil but the soft palate,

uvula, and palatine arches. The mucous membrane is swollen, dark red, and covered with a clouded secretion. The uvula is swollen and often elongated, resting upon the base of the tongue. If both tonsils are involved they are often seen to meet in the median line. The tumefaction is somewhat irregular in outline, and there may be often seen at the orifices of the follicles of the tonsil, a yellowish, creamy secretion, which may be mistaken for a diphtheritic patch ; it can, however, be easily removed by a probe, and will be found to be soft and friable, and possessing no fibrinous character.

The termination of acute tonsillitis is either by resolution or suppuration. It runs its course generally in from six to ten days, the height of the fever being reached generally by the fifth day. If both tonsils are involved, suppuration generally takes place in but one. The presence of pus may be detected either by the soft feel of the tumor, by the fluctuation, or by indications of its pointing at some place on its surface. The abscess may be discharged during the act of deglutition or vomiting ; it may break at night and its contents pass into the stomach, or the pus may be discharged into the pharynx, giving rise to serious troubles ; death by suffocation having occurred by the escape of the contents of the abscess into the larynx during sleep. The relief following the discharge of the pus is very marked and almost instantaneous.

Treatment.—In this as in other acute inflammatory disorders, attended with a high symptomatic fever, it is well, at the onset of the attack, to administer a mild cathartic ; and there is nothing better than a glass of one of the aërated bitter waters, as Pullna, Friedrichshall, Hunyadi Janos, etc. Failing these, a glass of the citrate of magnesia solution, or two or three drachms of Sal Rochelle may be given.

In seeing these cases of quinsy at the commencement of the disease, the question of bloodletting has frequently suggested itself ; and although I have never had the moral courage, in the face of the popular prejudice existing in our day against this procedure, to put it in practice, it seems to me that it would not only be a justifiable measure, but would be attended with most excellent results in curtailing the severity of the attack, and possibly in averting it. The disease is essentially a sthenic one, as evidenced by the full bounding pulse, distended blood-vessels, and general plethora which characterizes it ; and

moreover, as it generally attacks those in robust health, the question of venesection is worthy of consideration, unless especially contraindicated by the condition of the patient or the asthenic type which the disease occasionally assumes.

If there is any irritating or undigested food in the stomach, it should be gotten rid of by the administration of an emetic, preference being given to such as are not depressing in their action, as mustard, common salt, or simple warm water. The advantage of this measure is not only in the relief to the overloaded stomach, but also a certain amount of relief afforded to the swollen tonsils and palate in the pressure exerted on their engorged blood-vessels, in the act of vomiting; and in the removal also of the mucus which adheres to them.

If the patient is seen on the first day of the attack, an attempt should be made to avert it. This I believe can be accomplished in many cases by the following plan. A full dose of quinine as follows should be given:

℞. Pulv. opii..... gr. j.
Pulv. capsici..... gr. ij.
Quin. sulph..... gr. x.
M.

This may be given in a rice wafer, which is usually easily swallowed. If there is any difficulty, of course the method of administration may be changed and the dose given in solution as

℞. Tinct. opii..... ♏xij.
Tinct. capsici..... ♏xv.
Quin. sulph..... gr. x.
Acidi sulph..... dil. q.s.
Aquæ.....ad. ℥j.
M.

This should be followed immediately by the administration of aconite in full doses, frequently repeated. Owing to the uncertain strength of this drug, it is often difficult to nicely regulate the dose in such a manner as to obtain just the result desired. For this reason Fleming's Tincture should be preferred, as affording a preparation whose strength is more nearly unvarying than any other. Of this preparation there should be given from

one to three drops every hour, until its physiological effect is manifested in dryness of the fauces, dizziness, disturbance of the stomach, lowering of the pulse, etc. As a rule, this result will be obtained by the exhibition of two or three doses; no more than three should be given, however, in any case. The object of the aconite treatment is both to obtain its constitutional effect in controlling the general febrile symptoms, and also its local action on the fauces. If given early enough in the course of the disease this plan will often serve to break up and abort the attack. If this is not accomplished on the first day by the above-detailed procedure, it may be repeated on the second day; later than this, however, little can be expected from it, and other measures must be resorted to. These consist in internal and external applications. Of the external applications, none are so grateful to the patient as moist heat; this should be applied in the form of soft flannels, wrung out in water as hot as can be borne, and laid on the neck, the heat and moisture being retained by a piece of oil silk laid over the compresses. They should be changed often, and the procedure faithfully persisted in, until resolution or suppuration occurs. Much relief will be afforded by the application to the fauces of a mild astringent, such as potass. chloratis, ʒ ss.— ʒ j., cupri sulphat., gr. x.— ʒ j., zinci sulphat., gr. x.— ʒ j., tannin, ℈ j.— ʒ j., etc. These should be applied by preference in the form of the spray, the little atomizer, Fig. 63, answering an excellent purpose. Better still, however, is the steam atomizer, which gives the valuable aid of the hot steam in connection with the astringent. The effect of this is to cleanse the fauces of the accumulated mucus, which the patient as a rule is not able to expectorate, and also to control to an extent the acute inflammation of the mucous membrane which covers the phlegmonous tumor.

Pellets of ice are often grateful to the patient, being held in the mouth, or allowed to lie against the inflamed part, the head being thrown back. The persistent use of the hot application externally, with the hot steam internally, will serve a better purpose, however; and the plan is a more consistent one than that of cold applications internally, in connection with hot compresses externally.

As regards the administration of drugs at this stage of the disease, I am disposed to place little reliance on them;

although good authority will be found in the text-books for the use of no small part of the pharmacopœia, including guaiac, quinine, aconite, tinct. of iron, opium, belladonna, tartar emetic, chlorate of potassa, and numberless others. That guaiac exercises a controlling influence in quinsy, occasionally, is undoubtedly true; and this would seem to afford evidence of the truth of the view, which regards quinsy as a manifestation, often, of the rheumatic diathesis. On the other hand this whole subject of a special diathesis as governing the development of throat diseases, rests on such uncertain clinical observation that it seems to me that it only serves to confuse, and that we attain a clearer understanding of them by ignoring it and regarding these affections as purely idiopathic and local. As regards the use of other drugs, they are so uncertain in their action that we may as well confess that we possess no specific in acute tonsillitis, and content ourselves with simply treating symptoms, administering mild anodynes to relieve pain, and bending our efforts toward the promotion of the inevitable suppuration, if the abortive plan has failed; and this can best be accomplished by the application of heat, externally and internally, as suggested above. The question of using the knife will present itself early in the attack, and although it is often condemned unless there is evidence of pus formation, my own experience induces me to regard it as a valuable method of relief, and whether there is pus detected or not, I am accustomed to scarify freely. For this purpose a sharp-pointed, straight bistoury should be used, which may be thrust directly into the tumor with its cutting edge toward the median line, and then made to cut its way to the surface. Whether pus is evacuated or not, blood is drawn freely, and serves markedly to relieve the engorged blood-vessels and thereby to alleviate the distressing features of the disease. I have never seen any harm result from free scarification, but often much relief. It should be remembered, however, that the cutting should be made in the tonsil, and that the pillars of the fauces should not be cut through, as in this case permanent injury might be done in impairing the function of deglutition. If the tumor points high up in the palate, as it often does, the use of the knife should be confined to a simple incision or thrust, as, of course, cutting from a point high up on the palate, out to its free border, might do permanent injury.

In addition to the above measures there can be little else done, save the administration of concentrated nutrition, and sustaining the strength of the patient by such means as are possible. At best, the management of a case of quinsy is not satisfactory, the suffering of the patient is acute, the efforts of the physician to relieve but partially successful; still much can be done in the direction of cutting short the attack, and much in alleviating the more distressing symptoms.

Subacute Tonsillitis.

This is an inflammation of the parenchyma of the tonsil, of a catarrhal character, in which the inflammatory process confines itself entirely to that organ. It is of a mild type and limited duration, involving no serious consequences, and attended with none of the extremely painful symptoms which characterize quinsy sore throat, nor does it manifest any tendency to suppuration as does the graver affection. It may involve one or both tonsils, and consists in an attack of inflammation of the organ attended with marked increase of blood supply, a considerable swelling or tumefaction of the organ, and an increased secretion of mucus from its glandular structures. It is ushered in by chilly sensations, followed soon by mild symptoms of febrile movement, as evidenced by heat of skin, muscular pains, loss of appetite, and a moderate increase of temperature. Following the febrile motion there soon occurs a sense of discomfort about the fauces, with pain at the angle of the jaws and soreness extending to the cervical muscles. The movements of the jaw become somewhat impaired and painful. Swallowing is attended with more or less pain, from the pressure exerted on the inflamed tonsil by that act. The voice becomes affected by the mechanical interference with the free egress of the vocal waves, and assumes a thick and muffled tone. There is no cough, but a constant disposition to hawk and clear the throat of the accumulated mucus.

The affection results from taking cold, though the prominent predisposing cause is the existence of a moderate degree of hypertrophy of the tonsil. These attacks do not occur, however, so frequently in cases of extreme hypertrophy of the tonsil, wherein the tonsil projects a large, irregular, rounded tumor

from its bed, but occur rather in those cases of enlarged tonsils which consists in a moderate degree of hypertrophy in which the organ lies broadly and flatly in its bed, not projecting to any extent beyond the pillars of the fauces, but is simply enlarged to that extent that the space between the pillars of the fauces is distended laterally, viz., in those cases in which the tonsil is recognizable as enlarged, and yet not sufficiently so for extirpation by the tonsillotome.

The examination in this affection shows one or both tonsils enlarged, protruding from their bed, of a bright, angry-looking red color, in which the morbid process confines itself to the tonsil alone, the palate and uvula being, as a rule, in no degree affected. If both tonsils are involved they may be enlarged to the extent of meeting in the median line. They are coated with a thick, ropy, semi-opaque mucus, which adheres closely, and is hawked up with some difficulty. This condition should not be confounded with acute tonsillitis or follicular tonsillitis. In acute tonsillitis there are all the evidences of a phlegmonous inflammation, with a tendency to suppuration. The symptoms are more prominent, and the pain of a more distressing character. The tumefaction also extends to the palate and surrounding soft parts, whereas, in the affection under consideration, the morbid process is confined entirely to the tonsil. There is no tendency to suppuration, and none of that deep-seated throbbing pain which indicates the formation of pus.

In acute follicular tonsillitis the morbid process is also confined mainly to the tonsil, but it consists in a fibrinous exudation, which is poured out into the crypts of the follicles, and shows itself in the pearly white spots on the surface of the organ; these are absent in the affection under consideration. As has been said, the affection is purely catarrhal in its nature, is not contagious, but shows a decided tendency to recurrence, especially during the Spring and Fall months, when all catarrhal affections are aggravated, and are liable to exacerbations.

Treatment.—The affection is not a serious one, nor attended with any grave symptoms; hence, oftentimes, it becomes only important with reference to its diagnosis; it may, however, give rise to more or less distressing symptoms, and, in all cases, should be subjected to treatment on account of its tendency to

recurrence, and from the fact that each recurrence leaves the organ in a less healthy state than that which existed before. It is through repeated attacks of this affection that chronic enlargement of the tonsil is frequently developed. At the outset of the attack a saline laxative should be given, followed in the course of one or two hours by from five to ten grains of quinine. If given early enough, the attack may be aborted by this procedure, but unless this is attained within from twenty-four to thirty-six hours, the disease will run its course of from four to six days. The quinine failing to arrest it, resort should be had to the use of aconite. The use of this drug in the early stages of an acute inflammation in the fauces is, undoubtedly, of great benefit, in not only exerting an influence on the febrile motion, but as also exerting a specific and localized influence on the fauces. In the affection under consideration most excellent results can be obtained by its use. The method I usually pursue is to give, according to the age of the patient, from half a minim to two minims of Fleming's tincture every hour, for three or four hours, or until the physiological effect of the drug has been obtained, in the dryness and tingling about the fauces, then ceasing until the next day, when it should be repeated, unless decided relief has been obtained from the prominent subjective symptoms. This plan may be pursued on the first and second day, but, as a rule, it will prove of little avail any later.

As will be noticed, the plan of treatment recommended is very similar to that of acute tonsillitis. The disease is of course nearly related to that of quinsy, and up to a certain point is quinsy; but while the one develops into a phlegmonous inflammation, the other remains a simple catarrhal process. The condition to correct at the onset being then much the same, the treatment is similar. The administration of the aconite may be commenced immediately after the laxative has been given.

In addition, much relief will be afforded by the use of a gargle of chlorate of potash, alum, borax, tannic acid, etc., as, properly used, they may be allowed to come in contact with a large portion of the diseased organ. Pellets of ice, either swallowed or allowed to lie against the inflamed organ, by throwing the head back, will prove grateful to the patient, and serve in a degree to control the morbid process. Steam inhalations are

of no avail, nor should the applications externally, of either hot or cold water, be encouraged, as their advantage is but very limited. As a rule, it may be stated, in regard to this affection, that we possess the means of limiting and controlling it in the internal administration of remedies which are more cleanly, more simple, and more efficient than the uncleanly, and oftentimes even mischievous external applications of hot poultices, fat pork, onions, poppy-heads, hops, cold cloths, ice bags, and indeed the whole category of domestic remedies of this kind. In a large majority of cases these applications are not properly made and not properly followed up. If cold applications are used they are allowed to remain until they become hot, and thus act as fomentations; if hot applications are used, they are allowed to remain until they become cold, and their original design is thus aborted. It may be added that they are extremely liable to add to the discomfort of the patient rather than to his comfort. This of course is only intended to apply to the mild affection under consideration, for while in the graver and more distressing acute disease these hot applications are of the greatest value, and on account of the severity of the suffering it entails they will be applied faithfully and with care, and with the purpose of promoting suppuration; in the milder disease the same care will not be exercised, and moreover their design of hastening pus-formation is not an object of treatment.

In addition to what has been suggested in regard to local applications, it may be added that relief will be afforded by the use of astringent solutions thrown on the diseased part in the form of spray. This is of benefit not only in the local action of the solution used, but also in serving to cleanse the tonsil of the thick mucus which adheres to it. In this manner there may be used sulphate of zinc, gr. x.—℥ j., chloride of zinc, gr. v.—℥ j.; to which may be added a small portion of carbolic acid, two minims to the ounce. The little atomizer shown in Fig. 63 serves excellently for these applications, and can easily be manipulated at the hands of the friends or attendants.

The question often suggests itself, in connection with this affection, of amputating the tonsil during one of the attacks. This I believe to be a perfectly justifiable procedure; the object being not only to cut short the existing attack, but also to remove the cause of the recurring attacks. An additional justification for the operation during an attack is, that in very

many of these cases the tonsil, after the subsidence of the attack, sinks so entirely into its bed behind the pillars of the fauces as to render the operation somewhat difficult. Whereas, when it is swollen by the inflammatory process, it presents an exceedingly favorable form for excision.

Acute Follicular Tonsillitis.

This affection is an acute inflammation of the tonsils in which there occurs an exudation of fibrinous material which is poured out into the cavities of the follicles which compose the organs and so far fills up and distends them, that there results a far greater amount of pain and tenderness in the parts, due probably to pressure on the terminal filaments of the nerves, than are met with in simple catarrhal inflammation ; and also, of course, considerable enlargement of the glands. It is ushered in by a chill, followed by a high fever, and unless arrested in its earlier stages, runs a somewhat definite course of from four to six days. The exudation in the tonsil overflows the cavity of the follicle, and shows itself on the surface in a number of small, round, pearl-colored gray spots. The gravity which attaches in the minds of the laity to white spots in the throat, oftentimes serves to invest this disease with a danger which never attends it. Its tendency is always to get well, and its progress, although attended with extreme pain and distress, is never complicated by any mishaps of a serious character.

Its early recognition, however, is of importance as enabling the physician to give assurance of its harmless character. What was said in regard to membranous sore throat is true of this disease also, viz., that it is probable that there is a previous blood condition, or hyperinosis, which dominates and controls the inflammatory process, which results from taking cold, and gives rise to an exudation of lymph rather than a simple catarrhal inflammation ; and while in membranous sore throat this occurs on the surface of the mucous membrane, in the disease under consideration it occurs in the cavities of the follicles of the tonsil. Hence, what was said of the former disease is true also of this ; that the incipient chill and subsequent fever are more marked than we should expect to find as purely symptomatic of an inflammation so limited in extent. The chill, as a rule,

is quite well marked, though there may be merely chilly sensations. This is followed by a feeling of dryness and tickling, or irritation in the throat with extreme pain in swallowing. This is always a prominent feature of the affection, the pain being of a sharp, lancinating, cutting character. The exudation into the follicles and their distention, gives rise, of course, to a certain amount of pressure on the terminal nerve-filaments, and as a consequence, a considerable degree of constant pain referable to the inflamed part. This pain is necessarily very much aggravated by the pressure to which the tonsil is subjected in the act of swallowing. The disease may attack one or both tonsils, and it may involve the whole tonsil or only a few of the follicles. The general subjective symptoms correspond to an extent with the gravity and extent of the inflammatory exudation.

The course of the disease, as was said before, is toward a termination in four or five days by an absorption of the exuded matter, the subsidence of the swelling and infiltration, and the disappearance of fever and all other symptoms. Occasionally, in the more aggravated forms of the affection, where the follicles are greatly distended, there occurs the formation of small abscesses, involving one or more follicles and resulting from the closure of the follicular orifice, the retention of the exudation, and its suppuration.

On examination there will be found one or both tonsils swollen and projecting somewhat from their bed, the mucous membrane covering them of a bright, angry red color, and on the surface of the tonsil there will be seen from three to eight or ten small, round, grayish, pearl-colored spots, their borders being entirely separate as a rule, though occasionally the exudation may extend so far that several spots may coalesce, producing the appearance of a small membrane. These spots are well marked in the more aggravated cases, and unmistakable; while in others, where but few follicles are involved, and the exudation is limited in extent, the spots do not show themselves clearly and distinctly, but are only seen on close examination. The crucial test is, that it will be found on using a bent probe, that it passes readily and freely through the centre of each spot into the large and distended cavity of a follicle. This test should always be resorted to where there is any doubt as to the character of the exudation.

The cause of this affection is from taking cold in a majority of cases; and yet behind this there is probably some especially predisposing cause of which we are ignorant. That it is something in the nature of an essential fever, there is good ground for supposing; yet that it is contagious, I do not believe. It often prevails somewhat as an epidemic and also endemically. In cases it has run through a family, attacking nearly every member; and yet it is far more liable to attack them at nearly the same time than seriatim, in which latter case there would be evidence of its being contagious. It frequently attacks those worn out and fatigued by overwork and loss of sleep; especially those engaged in caring for the sick. I have not infrequently met with it in those engaged in nursing children sick with diphtheria; and in these cases it is not uncommon for the attendant to insist that she has contracted diphtheria from the child. There is absolutely no connection between the two diseases, and yet a fond mother will often derive a morbid comfort in the thought that she has contracted diphtheria from her child, when she has a follicular tonsillitis; and, moreover, physicians of our own school, as well as the other school, often encourage her in the notion and coincide with her.

Treatment.—At the commencement of the attack a full dose of quinine should be given, followed by the tincture of iron in glycerine, as follows:

℞. Tinct. ferri chloridi..... ʒ j.—ʒ ij.
Glycerinæ.....āā ʒ ij.
M. Sig.—One teaspoonful every two hours.

This should be given without the addition of water; the iron given in glycerine is deprived of much of its disagreeable taste, and is made a not unpleasant dose. It acts, probably, as a local astringent in passing over the inflamed organ, and also exercises a controlling influence on the general condition. This mixture I regard as almost a specific in the disease under consideration, as it serves not only to control and cut short the duration of the attack, but in most cases from the first dose given, affords relief to the pain which is often of a very acute character.

Occasionally additional relief will be afforded by the use of astringent lozenges of tannin, hæmatoxylon, acidi benzoici, etc.

Or there may be given potass. chlorat. as follows:

℞. Potass. chlorat.,
Pulv. acacia,
Sacch. alb.....āā 3 j.
M.

A small portion of this taken on the tongue and being dissolved in the saliva, is swallowed slowly and thus comes in contact with the diseased part. These remedies are, however, of limited value.

Next in importance to the iron and glycerine, I regard the local application of nitrate of silver. This remedy should rarely be applied to a mucous membrane in a greater strength than gr. xx.—ʒ j., unless it is desired to destroy tissue. In fibrinous exudation, however, it should be used of a strength of gr. xl.—lx. to ʒ j. in order to completely destroy the membrane or exudation, and to prevent a recurrence. In the disease under consideration it is necessary, in order to reach the site of the morbid process, that the application should be made into the cavities of the follicles. For this purpose a slender probe should be bent at right angles, and with an extremely thin film of cotton wrapped on its extremity, and charged with nitrate of silver of the above strength, should be passed directly into each crypt. The result of this is the destruction of the exudation and the prevention of its recurrence. The procedure is a very simple one, not attended with pain, and affords much relief.

CHAPTER VIII.

HYPERTROPHY OF THE TONSILS.

By hypertrophy of the tonsils is meant any abnormal enlargement which does not directly depend on acute inflammation, or on the growth of any new formation in or upon the structure of the gland. The tonsil is enlarged, partially by the distention of the follicles by their perverted and degenerated secretion, and partially by the hypertrophy of the parenchyma of the organ resulting from chronic inflammation.

The cause of this affection is not always perfectly clear, the most frequently assigned cause being repeated attacks of acute inflammation, which lead to permanent and additional deposits in the glands. A single acute attack, either simple, as in measles, or specific, as in diphtheria, may result in permanent enlargement of the organ; or, again, the attack may be chronic from the commencement, and the first time attention is called to the fauces, the glands are found greatly enlarged. In this case, however, it is frequently associated with scrofula or rachitis, which is said to be a very frequent cause of the trouble. Its association with scrofula is easily understood from the anatomical and physiological character of the gland; but that it is, in this country at least, commonly due to the rachitic taint, is probably not true, for, whereas, an enlarged tonsil is very frequently met with, rachitis is of comparatively rare occurrence. Dentition in children has been asserted to be a cause of the affection, as also disturbances of digestion producing temporary engorgement of the tonsils, which, frequently repeated, may produce permanent enlargement. Among the poorer classes, surrounded as they are by bad hygienic influences, living in close and ill-ventilated apartments, supplied with insufficient or improper food, subjected to exposure, and the various circumstances which attend life in the lower strata, and which we recognize as powerful factors in the development of that aggre-

gate of symptoms which we call scrofula, we not infrequently meet with enlargement of the tonsils, due directly to these causes.

In most that has been written on this subject, but one form of enlargement is described. To my friend Dr. M. D. Mann I am indebted for the results of some investigations which he has been making on this subject, and my own observation so fully coincides with his research, that I readily accept his statements. He finds that anatomically we meet with two forms of enlargement of the tonsils; one due to an hypertrophy of the stroma of the organ, while the other is due to an enlargement and distention of the glandular structures; commonly, both conditions are more or less associated; one, however, predominating over the other, and the tonsil will present different appearances, according as the one or the other process is in the ascendancy; or, again, one process may go on almost to the entire exclusion of the other. If the follicles are the principal seat of the lesion, that is, if the epithelial elements are involved to the exclusion of the connective tissue, and we get a true hypertrophy of the gland or an increase in the proper gland tissues (See Fig. 77), we then have an appearance with which we are all familiar; the gland is roughened on its surface and irregularly nodular; the follicles being distended, the secretion presents at their open mouths, and can be wiped away or pressed out; the glands are soft and friable, and easily transfixed with a

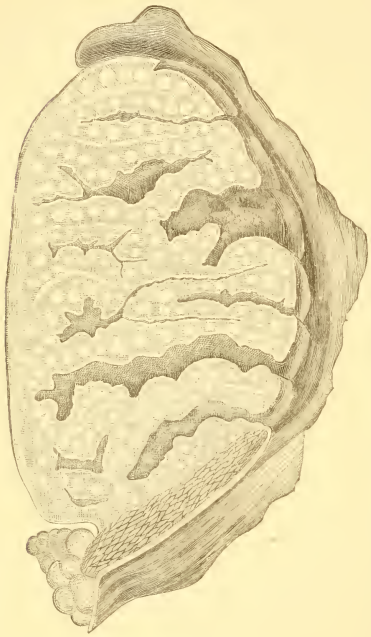

Fig. 77.—A section of the tonsil in a state of true hypertrophy, showing the enlarged and distended follicles with their thickened walls. (Luschka.)

probe. On the other hand, if the increase in size depends on growth and proliferation of connective-tissue elements, a very different condition and appearance is produced. The surface of the gland is smooth and rounded. If seen in the earlier stages of the disease, it is soft and compressible, but in the more advanced stage, it is firm and elastic. The follicles are compressed and atrophied, their function being abolished. There is, of course, an absence of the degenerated and cheesy secretion which is so characteristic of the first form of enlargement. The latter form of the disease we may call the *hyperplastic*, while the first, from being a true hypertrophy, we describe as *hypertrophic*. The hypertrophied tonsil probably results from acute attacks of catarrhal inflammation, while the hyperplastic tonsil, depending as it does on an increased vascular supply, with increased growth and cell-proliferation, is often the result of the strumous diathesis, and is chronic from the beginning. The course of the first, or hypertrophic form, is a continuous growth as long as the acute attacks are frequently renewed, and is the form more commonly met with in adults. The hyperplastic form, depending as it does on a peculiar diathesis, is largely confined to children, and commonly disappears at puberty.

The age at which enlargement of the tonsils appears is in childhood and youth. It rarely appears before the second or third year of life, but during the years of childhood is quite common. Many cases disappear at puberty, either by absorption of the freshly formed and imperfectly organized connective tissue, or by a shrinking or contraction of the connective-tissue bands which are too well organized to be absorbed. Even if the enlargement does not diminish, if it does not increase, after puberty it may cease to be a source of trouble, as at that time the throat and fauces undergo a considerable development, and tonsils which before puberty might cause obstruction in the throat of the child, become relatively small and cease to be an obstacle in the larger and more roomy passage of the adult. It is extremely doubtful whether true hypertrophy ever disappears except by excision, or even that it remains stationary, but more probably it goes on growing in size and keeping up the train of symptoms which its presence excites. As a rule, both tonsils are affected together, and generally to the same extent, though not infrequently they differ

in size, and even one tonsil may be greatly enlarged while its fellow is unaffected. The general tendency of the growth is toward the median line, though there is an additional and decided tendency toward the growth downward, which may go on to such an extent that its amount can only be determined by the finger or the mirror. It may also extend upward toward the Eustachian tube, and produce symptoms with reference to the hearing. Adhesion between the tonsils and pillars of the fauces are of frequent occurrence.

The diagnosis, of course, is simple, inspection of the fauces being sufficient; but it should always be borne in mind that in the examination, if retching occurs, and consequent contraction of the muscles of the fauces, the tonsils are lifted from their bed and crowded forward toward the median line in such a way that a tonsil with a very moderate enlargement may be made to appear of an unusual size. Hence, in making the examination, a little patience should be exercised, that a view of the parts at absolute rest may be secured, in order to form a proper estimate of the amount of hypertrophy that really exists.

Prognosis.—From what has been said before it will be easily inferred that the prognosis depends somewhat on the character of the enlargement, the age of the patient, or the duration of the trouble. If the growth is glandular in its nature, that is, if true hypertrophy exists, assurance may be given with absolute certainty that it will not disappear under medication or local applications, but that the only remedy for the disease is the complete removal or destruction of the organ. If, on the contrary, we find an hyperplastic growth, and we see the case in the early stages, we may hope by proper medication to arrest the progress of the disease, and accomplish the absorption of the already effused material. If the case is quiescent and near the age of puberty, we may anticipate with considerable confidence the disappearance of the tonsil with the appearance of the usual growth that occurs at that period, provided the general health is not impaired. If we find, however, as we do in so many of these cases, that under the influence of impaired or insufficient aëration of the blood, broken sleep, disturbed digestion, etc., due unquestionably to the enlarged tonsil in many cases, that the general health is failing, the operation will be necessary and even im-

perative. Again, if the patient is an adult, and the disease has existed from childhood, no hope of relief can be afforded save by an operation.

Symptoms.—If the tonsils are but moderately enlarged, the symptoms are not marked; perhaps nothing more than a moderate degree of secretion from the fauces, with a disposition to take cold easily, which manifests itself in an ordinary sore throat. The greater degree of enlargement, however, gives rise to a train of symptoms which often fail of recognition as connected with this disorder.

The peculiar voice of a patient with enlarged tonsils is familiar to all; it is thick, with a half-muffled character, together with an absence of any nasal twang. This character of the voice is due partially to the closure of the palato-pharyngeal space by the encroaching tonsils, and partially to their interference with the free movement of the palate, and also with the play of the tongue which is necessary to a clear and healthy tone of voice.

Snoring is another constant symptom of the disease. The breathing space in the fauces is so far encroached upon, that the patient involuntarily opens the mouth during sleep, and respiration is accomplished through both the nose and mouth, whereby the soft palate and uvula are thrown into vibration, giving rise to that disagreeable sound which we call snoring. This may accompany both inspiration and expiration, though as a rule it belongs to inspiration.

Dr. Haward, of London, first called attention, in 1873, to the frequent occurrence of nightmare in this affection, explaining it by the fact that the narrowing of the fauces so far interferes with respiration as to prevent perfect aëration of the blood, causing cerebral congestion and consequent disturbed functional activity. During waking hours this deficiency is compensated; the deficiency in the blood being counterbalanced by the increased respiratory effort, the "*besoin de respirer*" giving rise to increased muscular activity. During sleep, on the other hand, this voluntary aid to respiration is withdrawn, and involuntary respiration fails to supply the blood with oxygen. As a result of this, the carbonic acid accumulating in the blood, the lung circulation is clogged, and consequently the functional activity or disturbed brain action ensues, taking the form of the familiar phenomenon of

nightmare. A peculiarity of nightmare in enlarged tonsils is, the tendency to recurrence of the attack several times in the same night, and this is peculiar to this disease alone; the nightmare of indigestion or dentition rarely if ever occurring more than once in the same night. We see an exemplification of this in many cases of pulmonary, cardiac, and laryngeal diseases, where involuntary muscular effort is insufficient to carry on respiration, and sleep is sacrificed to the necessity of remaining awake, for the sole purpose of keeping in play the involuntary muscles of respiration in order to preserve life.

A slight hacking cough is often noticed in enlarged tonsils, and is due to the fact that the patient opens the mouth to breathe while asleep, and as a consequence, the parts become dry, parched, and painful, and hence an irritating cough sets in.

Deglutition is interfered with by the diminution of the capacity of the fauces, and also by the mechanical interference with the free action of the muscles concerned in propelling the food into the œsophagus. There is a tendency to renewed catarrhal attacks; that is, a patient with enlarged tonsils takes cold on a very slight provocation; as a result of which, the previous symptoms are markedly aggravated, particularly the difficulty in deglutition, owing to the tenderness of the inflamed organ. In 1838 Dupuytren called attention to a peculiar deformity of the chest which he found in connection with hypertrophied tonsils, and which he regarded as the direct result. This deformity consists in a peculiar bending of the ribs, by which the sternum is forced prominently forward, and the chest compressed from side to side, the antero-posterior diameter bearing a close relation to the lateral, and producing what we call pigeon-breast. Dr. Shaw, of London, published, in 1841, a very ingenious explanation of this deformity, which was as follows: The isthmus of the fauces is so far narrowed as to prevent sufficient entrance of air; the *besoin de respirer* becomes very great; the respiratory muscles are brought into vigorous action; the ribs are elevated, but not sufficiently to allow of free access to the lungs; a vacuum or a tendency to a vacuum is created between the sides of the lung and the chest-wall laterally; to fill this vacuum, the ribs are bent, and sink in at the sides, forcing the sternum forward. This explanation is a plausible one, but it seems difficult to accept the original theory, for we can scarcely realize any obstruction in

the fauces sufficient to produce the deformity unless there had already existed coincident softening of the ribs. We should then be led to the conclusion that rickets already existed, and knowing, as we do, how commonly rachitic children suffer from enlarged tonsils, we may reasonably conclude that the enlargement of the tonsils and the chest deformity are due to a common cause. The same is true of the dilatation of the anterior nares, sometimes attributed to pressure of the enlarged glands.

If respiration is interfered with of course the supply of oxygen is curtailed, and oxygen is not only the great agent of respiration, but is the great stimulant or excitant of nutritive action; consequently, as a result of enlarged tonsils, we may look for more or less impairment of nutrition; the mere presence of the disease in the fauces being sufficient to account for symptoms which indicate impairment of the general health. The follicles are filled and distended by what, when it is first poured out, is comparatively healthy mucus, containing epithelial cells. This secretion, however, remaining in the follicles, undergoes decomposition, and becomes, to an extent, putrid. As the processes go on by which this matter is deposited under the influence of successive exacerbations, acute in character, the decomposed material presents itself at the mouths of the follicles and is swept into the stomach with the food.

This condition also serves to vitiate the inspired air, which in passing over it becomes to an extent impregnated with the fetid emanations which have their source in the putrid masses. As a result of this, continued as it often is over a long period of time, it is not surprising that the general health, which may have been robust in the earlier stages, finally succumbs. We may have also the still further symptom of anæmia; this is the direct consequence of the disease. Its mode of development, with its usual symptoms of pallid face, palpitation of the heart, shortness of breath, etc., needs no further explanation. But going still further, I recall in my experience several cases in which the sequence of events could be traced to enlargement of the heart by dilatation, due unquestionably to hypertrophy of the tonsils, of long standing. As we know, the first muscle of the body to receive its blood-supply is the busiest, viz., the heart; it is also the quickest and most sensitive to feel the deficient quality of the blood-supply it receives;

it is weakened as the result of insufficient nourishment and also by the additional labor of pumping impoverished blood through the arteries, which, as we know, flows with more resistance through the circulatory system than healthy blood. In the disease, then, under consideration, the general health and blood becoming impaired, the heart is quick to feel the additional labor upon its already weakened walls, and yields to hypertrophy by dilatation.

Spasm of the glottis often occurs in enlarged tonsils, but here, as in pigeon-breast, the relation of cause and effect is not evident, as the best modern writers attribute spasm of the glottis to rickets, and hold that this is due to irritation of the brain caused by craniotabes. It seems more probable that the two diseases are due to a common cause, rather than that there is any genetic connection between the two. Impairment of hearing, with tinnitis aurium, is often met with in connection with this affection ; this is due in part to pressure on the opening of the Eustachian tube, and in part to thickening of the mucous membrane, resulting from the catarrhal condition which often accompanies enlarged tonsils. To whichever of these conditions the impaired hearing may be due, a removal of the gland is always attended with a marked improvement, if not its total restoration ; and if it is the mucous membrane alone which is at fault, the removal of the gland is imperative, in order to obtain free access to the diseased part, for its proper examination and treatment.

Treatment.—This must depend upon the cause, nature, and stage of the disease, in the particular case with which we have to deal. If the patient is young, and the enlargement slight and of short duration, no treatment other than a proper prophylaxis against further enlargement will be necessary. If we have to deal with a case where the scrofulous or rachitic diathesis exists, and the trouble has not existed too long, we may hope to remove the enlargement, as we do many other glandular enlargements met with in these conditions, by proper constitutional measures. Iron, cod-liver oil, iodine, both internally and locally, the lacto-phosphate of lime or arsenic, conjoined with proper hygiene, will do all that can be done, and will fortunately often be successful. If the enlargement is due to repeated catarrhal attacks, we can at best only hope by careful prophylactic measures to arrest the further progress of the dis-

ease. Showering the neck with cold water serves to render the surface less susceptible to the influence of cold, and diminishes the number of attacks.

As local remedies, there are few of the many astringents in the whole pharmacopœia but have been recommended. As a simple astringent, nearly free from irritating qualities, a saturated solution of tannin, either in water or glycerine, is excellent. This should be applied twice a day over the whole gland, and in many cases will accomplish much good. Of the mineral astringents, nitrate of silver, ten to twenty grains to the ounce, is the best; for in addition to its astringent action, it possesses the property of promoting absorption. Gargles of alum, chlorate of potash, or borax, may be used with some benefit. For promotion of absorption, the use of the preparations of iodine promises the best results. In true glandular hypertrophy we cannot hope for much benefit, but in the hyperplastic form of enlargement, iodine used locally will oftentimes serve to produce a shrinking of the gland. In using iodine it should be borne in mind that the simple tincture is insoluble in water; the compound tincture, however, is freely soluble. In this form, then, the iodine can be taken up by the absorbents, and penetrating deeply into the tissues, materially affect the disease. Other drugs in common use are iodide of potash, muriate of ammonia, and iodide of ammonium; their administration, however, is extremely uncertain in its results. Guiac internally administered is said to possess a most satisfactory action in removal of enlarged tonsils. I have never seen any good result from its administration.

If astringents and absorbents fail, and in a very large majority of cases they do fail, the only resort remaining is removal of the gland by caustics or the knife. The mineral acids, nitric and muriatic, have been used for the destruction of enlarged tonsils; both are very violent in their action, and it is extremely difficult to limit it. As regards nitrate of silver, it is very slow in its action, and forms an insoluble compound with the albumen of the tumor, an albuminate of silver, hence its action is extremely limited. The alkaline caustics are preferable, from the fact that their compounds with albumen are soluble in water, and therefore they extend their action much more deeply into the tissues; the difficulty with them is in limiting their action. Dr. W. J. Smith, of

London, overcomes this difficulty by using a small platinum disk, mounted on a handle; on this he fuses the layer of caustic and holds the surface in contact with the gland for a moment at a time, accomplishing its complete destruction in six or seven sittings. Mackenzie, of London, uses London paste and claims very successful results. Donaldson, of Baltimore, makes small incisions into the tonsils and inserts crystals of chromic acid. As regards the destruction of enlarged tonsils by any of the various caustics, it may be said that it is a tedious and painful procedure, and as a rule should only be resorted to where there is good reason, contraindicating the use of the knife. Their excision on the other hand is simple, speedy, comparatively painless, easily accomplished, attended with no danger in the vast majority of cases, and in every respect so much to be preferred to the use of caustics, that there should be little question with regard to its adoption. When, therefore, we meet with a case which will not yield to, or which has gone beyond the condition which yields to the simple remedies before spoken of, and which demands destruction or removal, and under this head we may class all cases of true hypertrophy and a large proportion of cases of hyperplastic enlargement, my preference is very decidedly in favor of the use of the knife. This should be done immediately and without delay, unless there exists some concurrent inflammatory condition of the fauces, such as ordinary catarrhal sore throat, which occurs so often in connection with enlarged tonsils; if this exists, the operation should be delayed until the attack subsides, simply for the reason that it increases and aggravates the inflammatory trouble, and also that the inflammation resulting from the operation, usually unappreciable, is liable to be much aggravated. Aside from this consideration, there is no good reason for delaying the operation. Delay will oftentimes be urged, on the ground that the patient is too weak and delicate, and that time should be afforded for a course of tonic treatment, a building-up process, to enable the sufferer to better endure the operation. The operation itself is so extremely simple and painless that no preparation is required; and, furthermore, for the weak and delicate condition that exists, the best tonic that can be administered is the removal of the gland, allowing thus the free access to the lungs of an abundance of pure air. As regards the dangers of the opera-

tion there is but one that needs be alluded to, and that is hemorrhage. This unquestionably has been much over-estimated. In the very large number of tonsils removed by myself, both in children and adults, I have never met with a single case of troublesome hemorrhage. M. Guersant says: "I have operated on a thousand children, and have only seen formidable hemorrhage in three cases." In many cases of hemorrhage the gravity of the accident has been greatly exaggerated by injudicious and nervous interference. Dr. Lefferts, of this city, had an experience which is so extremely instructive that I am induced to relate it in full.

He removed the tonsils from a young man at the Demilt Dispensary, and no hemorrhage appearing, left for home. Soon after reaching his office, at the end of an hour, he received a summons to hasten back to the dispensary as his patient was bleeding profusely. On returning, he found the man very much exsanguinated and weakened from loss of blood, and the fauces filled with a mass of blood and persulphate of iron. He learned that soon after his departure hemorrhage came on, and that the assistant immediately resorted to the use of iron in his efforts to control the bleeding, and with the usual result; he heaped layer upon layer of iron and coagulated blood upon the bleeding surface, but failed to stop the hemorrhage. Dr. Lefferts immediately cleared out this mass, and cleaning the cut surface found a small artery spurting. He seized it with torsion-forceps, twisted it, and the hemorrhage was over. The deduction is manifest. If arterial hemorrhage occurs, its source, as a rule, is from the tonsillar artery, and the first effort should be to seize the bleeding vessel; if, however, the hemorrhage is moderate, it can be relieved by simple pressure, either with the finger covered with a napkin, or with a pledget of cotton wool wrapped on a probe or held in forceps and pressed against the part. As regards the operation, it may be done with a probe-pointed bistoury (Fig. 78), or with one of the tonsillotomes especially devised for the purpose. If the bistoury is used, the tonsil should be seized with a pair of forceps; or, better still,

Fig. 78.—Tonsil bistoury.

with the vulsellum shown in Fig. 79, or some similar instrument, and being lifted somewhat from its bed, cut by two or three rapid sweeps of the knife. This requires, of course, that the operator should be ambidextrous, as in the removal of the right tonsil the cutting is done with the left hand and *vice versa*. I much prefer, however, the tonsillotome, in that the operation is quickly and rapidly done; it avoids the possibility of the knife cutting parts other than those it is designed to cut; and it renders absolutely impossible the cutting of the carotid artery, which is one of the supposed dangers in excision of the tonsils. It is often said, in regard to the operation, that the only truly surgical method is in the use of the bistoury. It is not possible, as a rule, to cut with precision; there is danger of cutting the pillars of the fauces and thereby impairing the function of deglutition, and the procedure may be prevented or rendered extremely difficult by the movements in the fauces or the struggles of the patient. Furthermore, in cutting with the bistoury, the operator will require four hands, one for the vulsellum, one for the bistoury, one for the tongue depressor, and one to hold the head of the

Fig. 79.—Tonsil vulsellum.

Fig. 80.—Mackenzie's modification of Physick's tonsillotome.

patient. If these were at his service, the operation would be a more commendable one. In the use of the guillotine, on the other hand, the operation is unattended with any of the above dangers and objections. The pillars of the fauces or the uvula cannot easily be injured, and, furthermore, the operation is

easily done by the use of two hands, one holding the instrument, while with the other hand the jaw of the patient is seized, and the head held firmly and steadily until the operation is finished.

The original idea of a guillotine for removing the tonsil was the instrument of Physick, which consisted in a simple plate

Fig. 81.—Fahnestock's tonsillotome.

containing an oval fenestrum on which there played a knife. This has been somewhat modified by Mackenzie, as shown in Fig. 80. Subsequently Fahnestock added a sliding stylet for piercing the tonsil before amputating it, by which it is prevented from falling into the air-passages. (See Fig. 81.) An ad-

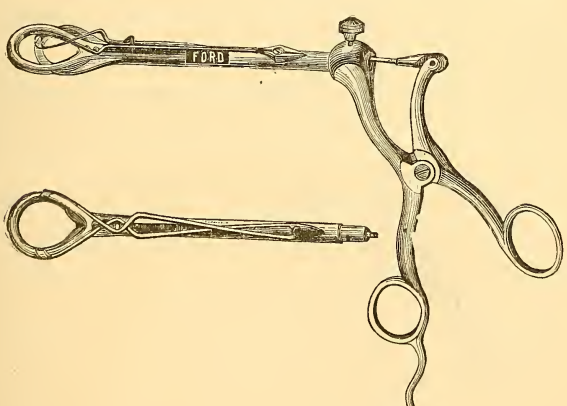

Fig. 82.—Improved German tonsillotome.

ditional improvement was made by which the mass is not only seized, but raised from its bed before cutting. This is shown in a German instrument. (See Fig. 82.) In this instrument the movement for raising the mass is automatic. Hamilton has further modified the guillotine by mounting the seizing forceps

on a freely movable hinge-joint, in such a manner that the mass can be grasped, and by a to-and-fro movement worked thoroughly into the fenestrum before cutting. (See Fig. 83.)

Mackenzie has devised a double tonsillotome, shown in Fig. 84, by means of which both glands can be removed at the same instant. This may be desirable at times in the case of a ner

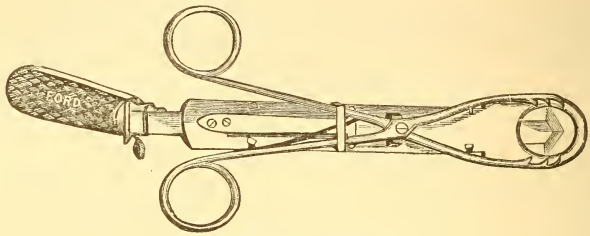

Fig. 83.—Hamilton's tonsillotome.

vous or excitable patient, but, as a rule, the single operation and instrument will be preferred.

"When the instrument is introduced into the mouth the blades must be in the centre, but on grasping the two handles together, the blades are thrown out against the sides of the

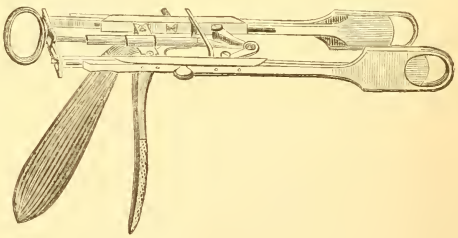

Fig. 84.—Mackenzie's double tonsillotome.

throat, and the tonsils received in the oval openings of the tonsillotome. Amputation is then effected by pressing on the ring at the proximal extremity of the instrument in the usual way" (Mackenzie).

It will be noticed, in regard to all the above instruments, that the longest diameter of the fenestrum is from before backward.

This is a radical defect, in that the longest diameter of an hypertrophied tonsil is invariably the vertical one. Hence, it will often be difficult to adjust any of these guillotines in such a manner as to include the whole gland, unless it be but moderately enlarged. Fig. 85 illustrates Mathieu's tonsillotome, with the method of holding it. I regard this as by far the most perfect instrument yet devised. As will be noticed, the long diameter of the fenestrum is the vertical. By this instrument the tonsil is first pierced by the fork and raised from its bed, and then the knife is drawn home, the whole operation being completed by a single movement of the hand. In operating with Mathieu's instrument it is well to seize the lower jaw of the patient between the thumb and two fingers, a towel being interposed, thus securing complete control over his movements. The instrument is then passed, with the fork side downward, back until the fenestrum is opposite the tonsil, using the instrument itself as a tongue depressor, when by a quick turn of the hand it is rotated upon the organ from below upward, and the operation rapidly completed. Of course the head-mirror should be used to afford a sufficient illumination. The great defect in many of the tonsillotomes lies in their fenestra being too small. It is well to have several sizes, but as the general practitioner will, as a rule, own but a single instrument, care should be exercised in the selection of one with a large fenestrum.

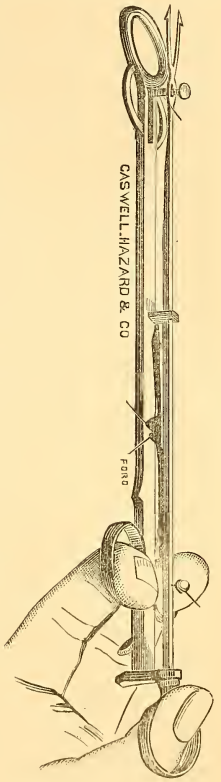

FIG. 85.—Mathieu's tonsillotome.

It is often asserted that, if but a part of the tonsil is excised, the remaining portion will atrophy; this is partially true only. If the distended crypts are cut through they will shrink up to a great extent, but there will remain the mass of the base of the hypertrophied organ, which is better away. The whole of the organ should be removed if pos-

sible in all cases, so completely that the pillars of the fauces will fall into their normal position, and that all vestiges of the tonsil may disappear. This cannot always be accomplished, but where it is possible it should be done. Certainly it is a mistaken idea to suppose that it is well to allow a part of the organ to remain to fulfil any function that it possesses in the economy. Practically the tonsil does not exist in health. After the removal of the gland by the guillotine there will occasionally be left small masses, or fragments, which can easily be removed by means of a pair of forceps, with the bistoury, or long scissors.

A condition of enlargement of the tonsil is frequently met with in which, on account of its broad flattened shape, it cannot be engaged in the fenestrum of the guillotine, and hence, cannot be excised by the ordinary manipulation of that instrument. In these cases I still regard the use of the tonsillotome as the best method of removal of the gland. The instrument having been placed in position, a tenaculum or vulsellum (Fig. 79) should be used to drag the tonsil from its bed and into the fenestrum, when the operation is easily completed. Hamilton's instrument (Fig. 83) is especially designed to meet these cases, but an unattached vulsellum will be found to be more easily managed.

CHAPTER IX.

SYSTEMIC DISEASES OF THE PHARYNX.

Syphilis of the Pharynx.

The manifestations of constitutional syphilis which are met with in the fauces, are *catarrhal pharyngitis*, *mucous patches*, *superficial ulcerations*, and *deep ulcerations*. Under the latter, however, it should be understood that there is included the deposit of gummy tumors, but in this situation they undergo such rapid progress into the ulcerative stage, that it is a matter of the extremest rarity to meet with them previous to the development of the destructive process. Occasional references are found, in the literature of syphilis, to the occurrence of phagedæna in the fauces; I think the nearest approach we find in this region to phagedænic action, occurs in the deep ulcerations resulting from gummy tumors, as their destructive progress is often quite rapid; but that this ever constitutes genuine phagedæna is open to question.

The extensive cicatrices and great deformities in the fauces, resulting from syphilis, are due to the deep ulcerations, and hence will be noticed under that head.

Catarrhal Pharyngitis of Syphilis, or Ordinary Syphilitic Sore Throat. — This manifestation of constitutional syphilis may occur as early as three or four weeks after the primary sore, or it may be delayed several months. It consists in the development in the mucous membrane of the fauces, as the result of the blood poison, of an acute catarrhal inflammation, involving the posterior wall of the lower pharynx and extending to the pillars of the fauces, the soft palate, uvula, and tonsils. This is the condition often described as erythema of the fauces. The term chosen seems preferable, in that there exists a genuine catarrhal inflammation of the mucous mem-

brane, characterized by redness, swelling, and hypersecretion. The appearances are much the same as those which we meet with in an ordinary sore throat of a non-specific origin. The membrane is actively congested, of a bright red color, and generally coated with a thin, semi-translucent mucus. The tonsils are somewhat swollen, and project from their bed beyond the pillars of the fauces. The uvula is swollen, and of a humid or watery appearance. The inflammatory process extends somewhat in front of the anterior pillars and involves the soft palate as far as its junction with the bony portion, where it seems to terminate abruptly in a well-defined line of demarcation. This appearance is not constant, and yet it is very frequently noticed; and while, as a rule, a syphilitic sore throat presents nothing by which we can distinguish it from an ordinary sore throat by mere ocular inspection; yet in this feature, if present, we often possess an aid to diagnosis, and one which should always lead to the suspicion of a specific origin for the attack. In simple catarrhal pharyngitis, it should be remembered, the inflammatory process shades off gradually into the healthy membrane beyond.

Of course if the sore throat comes on in connection with a secondary eruption on the skin, an alopœcia or other specific manifestation, the diagnosis will be rendered comparatively easy; but probably, in a majority of cases, this does not occur at the onset of the attack; but in a short time these will make their appearance, and the source of the faucial affection will be made clear. The subjective symptoms which attend the attack are those of the non-specific affection, and consist mainly in a sense of soreness and irritation about the fauces, some pain in deglutition, a feeling of fulness in the fauces, and a disposition to hawk and clear the throat, etc.

The treatment consists in the use of such local remedies for the relief of the subjective symptoms as have been noticed in the article on ordinary sore throat; in addition to these, there should be given mercury, internally. It has been the experience, probably, of most of us, that mercury given for the cure of syphilis before any of the secondary manifestations have made their appearance, is of little avail in preventing their development. If the system has been infected by the chancre, the roseola or some other secondary eruption will appear, whether mercury has been given or not. Upon the appear-

ance of the secondary eruption, however, whether on the skin or in the fauces, the drug should be given under the rules which govern the treatment of any case of constitutional syphilis. We possess no more efficient form than the bichloride, given in doses of gr. $\frac{1}{16}$ three times daily. If the medicine acts on the intestinal canal too freely, a small amount of opium should be combined with it. This treatment must be followed up for twelve months or more, occasionally intermitting the administration of the remedy for one or two weeks, and gradually reducing the dose after the first month, giving gr. $\frac{1}{20}$, and then gr. $\frac{1}{24}$, etc.

Mucous Patches.—This is another of the secondary manifestations of syphilis, the most frequent location of which is on the vulva and anus; its next most frequent site is in the fauces. It has been truly said of mucous patches that they are the first to come and the last to go. They may make their appearance from three to six weeks after the primary infection, or at any time during the history of the disease. A very large number of cases of syphilis will present the history of repeated and recurring attacks of mucous patches during the whole of their progress. These patches consist in an infiltration of the mucous membrane, in its superficial layer, with lymphoid cells which give it a whitish-gray, opaline appearance, very closely resembling the appearance produced by touching the part with nitrate of silver. If seen in its very early stages the patch shows itself as a faint bluish-white opacity in the membrane. As it progresses, this appearance deepens, and it becomes of a denser or grayish-white color. It soon extends laterally, becomes thicker, and is raised above the surface. If it appears in any position where the mucous membrane is reflected it may become fissured, as at the angle of the mouth or at the root of the tongue. Occasionally, when lying in an exposed position and subjected to the irritation of the movement of the parts, it may become ulcerated, the ulcer presenting the appearances of the ordinary superficial ulceration of the earlier stages of syphilis. The favorite locality of the mucous patch in the fauces is on the surface of the tonsil; rarely on the posterior wall of the pharynx. Its next most frequent site is on the pillars of the fauces, extending to the soft palate and uvula, forming a chain, as it were, along their border. It is also found frequently on the sides of the tongue and the inner surface of the

cheeks. The moderate amount of secretion from its surface is highly infectious, perhaps more so than that of any of the secondary lesions of syphilis. A very frequent and noticeable characteristic of these patches is their symmetry when displayed on the pillars of the fauces or tonsils. This is due to the fact that the parts are brought into apposition during the act of deglutition, and that a mucous patch that appears on one side of the fauces, stamps itself in perfect and symmetrical outline on the opposite side, with which it comes in contact during this act.

When the patch is confined to the tonsil, it requires a nice discrimination sometimes to determine its character. The tonsils are frequently somewhat enlarged and the face of an hypertrophied tonsil oftentimes will present the grayish and slightly mottled appearance of the mucous patch. It is very rare, however, to meet with a patch on the tonsil which does not extend somewhat to the pillar of the fauces, reflected from the side of the gland, and a close inspection will suffice to reveal the disease on the mucous membrane of the anterior pillar. The resemblance also of the mucous patch to the appearance produced by the action of caustic should be borne in mind. I have more than once been consulted by patients presenting every appearance of a mucous patch in the fauces, but, on inquiry, learning that caustic had been used, have been compelled to defer an opinion until one or two days had elapsed, when, of course, if the appearance was a mucous patch, it would still remain at the end of that time, but if due to caustic application it would disappear. Another appearance which is very frequent when these patches occur on the pillars of the fauces, is caused by a certain amount of irregular thickening to which they give rise in the membrane. This appearance is that of a finely scalloped border which each pillar presents, instead of the sharp straight edge presented when the mucous membrane is in a healthful condition. Wherever found, they are, as a rule, irregular in outline, somewhat mottled in appearance, the infiltration not extending equally over a given portion; there is no sharp line of demarcation, and the mucous membrane surrounding them is healthy in appearance and but slightly congested. The prominent subjective symptom connected with them is that of pain. They always give rise to more or less discomfort, and if seated in the fauces the

act of deglutition is often extremely painful, the pain being of a sharp, prickling character.

Treatment.—In addition to the general treatment for the specific disease, local applications are always required, the object being their complete destruction. For this purpose nitrate of silver, nitric acid, and acid nitrate of mercury may be used. Where, however, the patch is recent, and limited in extent and depth, a sixty-grain solution of nitrate of silver may be used ; ordinarily, however, the solid stick will be required.

The thorough cleansing of the surface of the patch by the sponge, or better still by the spray, with a solution of carbolic acid and borax, adds very greatly to the efficacy of the caustic. The application should be made daily. The infectious character of these patches should always be borne in mind in destroying them, especially if located in the fauces, as the manipulation of the parts is liable to excite a sudden cough, which may throw some of the infectious matter into the eye or other dangerous locality. More than one case has been reported in which grave results have followed this accident, as chancre of the cornea, resulting in loss of sight and constitutional syphilis.

Superficial Ulcerations.—This manifestation of syphilis in the pharynx occurs as early as three months after the primary infection, or as late as three or four years, and consists in the development in the mucous membrane of an ulcerative process, somewhat limited in extent, of moderately active destructive tendencies, and of a superficial character. It may commence in, or result from a mucous patch, when so situated that it is exposed to especial irritation, though, as a rule, it commences as a superficial erosion, which, progressing somewhat rapidly, develops into an active, ulcerative process. Its favorite locality is on the wall of the lower pharynx, near the posterior pillars of the fauces, or on one of the pillars. Sometimes we find it on the tonsil, or in the angle of the faucial pillars above the tonsil, and more rarely on the soft palate or uvula. It is generally rounded in outline, and elongated ; presenting a grayish-yellow surface, which is not markedly depressed below the surface of the mucous membrane surrounding it. The edges are somewhat sharply outlined, the mucous membrane surrounding it slightly reddened, but rarely to the extent which characterizes the areola of the tertiary ulcer. The secretion from its surface is limited in extent and purulent in

character. These ulcerations are not necessarily painful except when impinged upon by the bolus of food, or irritated in the act of swallowing.

Treatment.—In addition to the general treatment required in these cases by mercury, local treatment should always be resorted to and followed up faithfully and persistently, in order to arrest as soon as possible the destructive progress of the ulcerative action, the ulceration oftentimes involving parts where loss of tissue may lead to serious impairment of their function, as when situated on the soft palate or uvula, pillars of the fauces, etc. Heretofore, the treatment of these ulcerations has been mainly by destructive measures, as nitrate of silver, nitric acid, and the various caustics, including the galvano-cautery and actual cautery. This treatment is not only extremely painful, but also involves an additional loss of tissue, over and above that caused by the ulcer; a waste of tissue, by the means employed to cure it. In iodoform we have a remedy whose specific action in arresting the progress of these ulcers leaves nothing to be desired. It is entirely painless, it is not a destructive agent, and by its mere presence on the surface of an ulcer it seems to change the wasting process to a reparative one. It may be applied pure, or it may be mixed with morphine and tannin, according to the formula given in the appendix. The surface of the ulcer should always be thoroughly cleansed before the powder is applied: this can be done with a sponge, the probang, or the spray; any simple cleansing solution being used, as solution of common salt, carbonate of soda, carbonate of potash, to which, also, carbolic acid may be added. There is no better solution, however, than that given in the appendix (Prescription No. 1.). The application should be made every day, or every second day, until the character of the ulceration is entirely changed, and its surface is seen to be covered with healthy granulation-tissue.

Tertiary or Deep Ulcerations.—In the latter stages of constitutional syphilis, extending over a period of from four to twenty years after the primary infection, but occurring, in the majority of cases, between the seventh and tenth years, we meet with a class of ulcerations of the fauces, which present entirely different characteristics from those previously described. They are more virulent in character, more rapid in their destructive progress, and extend, not only laterally, but

deeply, involving oftentimes very grave and serious results, merely from the amount of tissue destroyed. They are also characterized by the very extensive contractions which result from their cicatrices.

In a very large majority of cases, if not in all, they are due to the deposit of gummy tumors in the deep layers of the mucous membrane, which, breaking down, rapidly develop into ulceration. This ulceration, resulting from a gummatous deposit, develops so speedily, that it is extremely rare to see a case before the ulcerative process has set in. This deposit occurs in the cellular tissue, or submucous tissue, in the shape of small, rounded nodules, either singly or in groups; as a rule, however, they form rather extensive masses. Occurring in the skin and other tissues, these gummy tumors may remain weeks, and even months, without ulceration, while in the fauces, as before mentioned, they run on into the ulcerative process, oftentimes in a very few hours; hence, when our attention is first called to the throat, we find the destructive process fully developed, and oftentimes considerably extended. The new material deposited in the deep layers of the membrane commences to soften and break down in the centre, and this process making its way to the surface, gives rise to the characteristic appearance of the tertiary ulcer. It has a sharp cut, somewhat jagged and overhanging edge; the surface of the ulcer is depressed; the mucous membrane is excavated; and it is covered with a grayish-yellow purulent discharge, and also presents, oftentimes, a slightly gangrenous aspect, sloughy shreds or masses of necrosed tissue being discharged with the pus. The walls of the excavation present also a jagged and sloughy aspect. The mucous membrane surrounding the ulcer is inflamed to a considerable extent, and presents an appearance which is characteristic and peculiar. It is actively and acutely inflamed, markedly congested and swollen, and has an appearance which resembles no other discoloration of the mucous membrane of the fauces, and once seen, is always remembered. It may be described as a coppery hue, in connection with the angry-looking, beefy red of acute inflammation.

This appearance, or discoloration, of course, is most marked near the borders of the ulcer, and shades off into a healthy membrane beyond. The site of these deep, tertiary ulcers, is,

in the order of their frequency, the tonsil, the soft palate and uvula, and the posterior wall of the lower pharynx; though in whatever locality they originate, their tendency is to extend to neighboring parts. When occurring in the pharynx, however, their destructive progress is somewhat limited, that is, they manifest a tendency to extend only to the posterior pillars of the fauces laterally, to the œsophagus below, and to the pharyngeal tonsil above without involving it. This is an appearance not infrequently seen, though it must not be understood that these ulcers do not at times extend from the pharynx to the pillars of the fauces and soft palate. Occurring in the soft palate, they result very soon in perforation, and an abnormal opening into the posterior nares.

The resulting cicatrices from the healing of these ulcers, as above stated, is marked by very extensive contractions which may result in serious deformities in the fauces. These contractions or deformities are due partly to the cicatrization, partly to abnormal adhesions which are liable to take place, and partly to the destruction of tissue resulting from the morbid process. The most frequent deformity consists in the interference with the proper function of the soft palate and uvula by their more or less complete destruction, or from their being drawn to one side or the other by the abnormal contractions. A not infrequent result of these ulcers is adhesion between the soft palate and pharynx, by which the normal opening is more or less completely closed. I have in several cases seen so complete a closure of this orifice that the smallest probe was passed with difficulty. A perfect closure never occurs.

Treatment.—The early recognition of these ulcers and their prompt and vigorous treatment is of the utmost importance, as oftentimes their destructive progress is so rapid as to result in serious loss of tissue in a comparatively short time. The treatment consists in the prompt administration of large doses of iodide of potash carried to the extent of saturation of the system. I generally commence with fifteen grains, given three times a day, and increase the dose three grains each day, until a marked change in the character of the ulcerative process is recognized. The use of mercury is of limited value in this manifestation of syphilis, and it should rarely be resorted to until the ulceration has entirely healed, when it should be administered, according to the rules which govern the management of any case of con-

stitutional syphilis. It is scarcely necessary to add that I coincide with the teaching that the proper treatment of constitutional syphilis requires the administration of mercury for a period extending over from twelve to eighteen months. In connection with general treatment local measures are of the utmost importance. This consists in the thorough washing out and cleansing of the ulcerated surface by means of one of the cleansing solutions given in the appendix, and applied by the atomizer, or syringe. Great care should be exercised in thoroughly removing all the debris and pus from the surface of the ulcer by this means. Following this, there should be applied over the whole of the diseased surface iodoform, either pure, or in connection with tannin and morphine, as given in the appendix. The other remedies which have been resorted to in these cases, consist of destructive agents, as nitrate of silver, nitric acid, acid nitrate of mercury, chromic acid, caustic potash, the actual cautery and galvano-cautery. What was said, however, in regard to superficial ulcerations, as to the action of these remedies, holds true also in the main in regard to deep ulcers: that they add to the loss of tissue, they are extremely painful, and, as a rule, not so efficient as iodoform. That cases may occur which do not readily and promptly yield to the combined action of the iodide of potash internally, and iodoform locally, may undoubtedly be true, and yet, in a rather exceptionally large experience, I have never met with them.

As regards the extensive deformities resulting from the cicatrices from these ulcers, they often produce conditions which become the source of no little discomfort or distress in their interference with the functions of the fauces. Especially is this true of those cases in which there has resulted almost complete closure of the naso-pharyngeal opening, giving rise to nasal stenosis, impairment of the voice, etc. It would seem that something might be accomplished in these conditions by operative measures. It has been, I believe, the universal experience, that after cutting these adhesions, they close up immediately, and resist every effort to keep the parts separated. I have occasionally made the attempt to relieve them by dilatation, but with absolutely no success. It must be confessed then, that, at present, we possess no means of remedying these frequently distressing conditions, and that all that lies in our power is simply to palliate some of the more prominent symptoms.

Strumous Ulceration of the Pharynx.

It is still a somewhat unsettled question in regard to strumous ulceration in the fauces, whether it constitutes a separate and independent form of ulcerative action, or whether it is not really a manifestation of congenital syphilis. There are many features of the disease which in a marked degree resemble the syphilitic form of faucial ulceration, while others would seem to establish it as an independent disease. To finally settle the question, and fully establish the true status of so-called scrofulous ulcerations of mucous membranes, will require that the clinical investigation shall extend over a very lengthened period of time, and that it shall be somewhat more carefully made than has heretofore been done. For the present I am disposed to regard the two diseases as distinct, while nevertheless accepting the view that there is most excellent ground for regarding them as identical.

In strumous ulceration of the pharynx we have manifested a form of destructive ulceration which presents certain peculiar and distinctive characteristics. It generally commences in the soft palate or uvula, in a small localized infiltration of the membrane which soon undergoes disintegration, and develops into a true ulcerative process. This may occasionally have its starting-point in the tonsil or pillar of the fauces, but rarely, if ever, on the pharyngeal wall. It extends by an extremely sluggish and indolent progress to the neighboring parts, and eventually involves the whole fauces, including the hard palate, tonsils, pillars of the fauces, and wall of the pharynx. It may also extend to the nasal cavity and larynx. Its mode of extension to the nasal cavity is, as a rule, by involving progressively the mucous membrane and periosteum of the hard palate, and finally attacking the bone, leading to necrosis and perforation, then gradually invading the nasal cavity to the destruction of the bony septum and other parts.

The progress of this destructive process is marked by periods of apparent improvement and even arrest of the ulcerative action ; but this is, as a rule, deceptive, and sooner or later the disease is re-established, not, however, with any renewed activity, but with the same indolent but slowly progressive action. Furthermore it is noticed that the apparently successful at-

tempts of nature to heal the ulcer are balked by the absence of any attempt at genuine repair by the deposition of true granulation-tissue. The surface seems to become glazed over by a thin film which offers no valid resistance to the re-establishment of the disease. There is also a total absence of any attempt at cicatrization or contraction of the parts, as a rule. As the wasting process goes on, there is noticed frequently abnormal adhesions between the soft palate and pharynx, or pillars of the fauces, which serve to seriously impair the function of deglutition. The gums and cheeks are sometimes involved in the diseased action, as well as the tongue, the ulcer presenting the same appearances as in other parts.

The gross appearance of the ulcerated surface is peculiar. The edges of the ulcer are raised above the surface and are well marked and distinct. They are rounded and cord-like in appearance, and of a slightly reddened color. The mucous membrane beyond is not congested, and there is an absence, as a rule, of anything like the areola of the syphilitic ulcer. The mucous membrane surrounding the ulcer, however, for a considerable distance, is somewhat thickened and presents a slightly nodular aspect. The surface of the ulcer is, in its general coloration, of a pale pink tinge, and somewhat mottled in appearance. It is covered with minute reddened points, or papillated elevations, which give it a worm-eaten aspect. The discharge from the surface is not extensive in amount, and consists of a thick, ropy, muco-pus, which adheres somewhat tenaciously to the diseased surface. There are no enlarged blood-vessels noticeable beyond the border of the ulceration.

The wasting process is an extremely slow one, and as remarked there is no attempt at closure of the gaps made by the loss of tissue, the parts seeming to melt away, as it were, and disappear.

Strumous ulceration is essentially a disease of infancy and childhood. It may make its appearance at any time from birth to eight or ten years of age, but rarely later. The latest age at which I have met with it was in a boy of seventeen, but in this case the ulceration set in at eight years of age, and the progress of the affection was marked repeatedly by the usual apparent arrest of the disease for a time, followed by its recurrence, until it finally involved the nose, fauces, and larynx.

The general condition of a patient suffering from this local

manifestation of struma, is of course familiar to all. He presents, sooner or later, the usual pale, anæmic, putty-faced appearance, with the loosely-hung, flabby, spongy skin, coarse features, swollen abdomen, enlarged cervical glands, and generally badly nourished and emaciated condition, by which we recognize the scrofulous cachexia.

The subjective symptoms which attend the affection are mainly those due to the character and extent of the morbid action. If the integrity of the soft palate is much encroached upon, deglutition is not only painful, but the articles of food are liable to make their way into the nasal cavity during the act. The voice assumes a shrill, piping character, as a rule, but this is generally due to the laryngeal cavity being involved. It loses its nasal character from the destruction of the soft palate and closure of the palato-pharyngeal orifice. There is more or less cough present of a harsh and irritating character. Pain is not, as a rule, a prominent symptom. Hearing may be impaired by the disease extending to the pharyngeal orifice of the Eustachian tube.

Treatment.—As long as there is any doubt of the true nature of the disease, it becomes a question as to the propriety or justifiability of administering anti-syphilitic remedies, on the ground of its possible specific nature. I have made faithful and protracted trial of this treatment in several cases, in which I made the diagnosis of scrofulous ulceration, with the hope that my opinion might be discredited by the success of the remedies. The failure to accomplish any good results in these cases has, in part, led me to adopt the view that the disease is non-syphilitic. Of course it may be said that there is a strumous ulceration, and also an ulceration in the fauces of congenital syphilis. This is quite true, but in my experience the congenital syphilis presents much the appearance of acquired syphilis, but not that of the disease I have attempted to describe.

In the management, therefore, of these cases, while it is justifiable to administer the anti-syphilitic remedies, I should certainly urge that they be given in connection with cod-liver oil and the iodide of iron, and such remedies as serve to control the strumous condition. In addition to this, local measures should be resorted to for the control of the ulcerative action. These should consist in the frequent application of

iodoform after the parts have been thoroughly cleansed. The cleansing solution may be applied in the form of spray, or by the syringe, the solution used being the Dobell's solution (See Appendix, Prescription No. 1). In this form of ulceration the iodoform should be combined as follows:

℞. Morphia sulph ..... gr. ij.
Tannin ..... ʒ ss.
Iodoform ..... ʒ iss.
M.

The application should be repeated two or three times each week.

Much can be done by these local measures provided the general condition can be corrected. If the disease is not of long standing much may be hoped for as the result of treatment. If, however, the disease has existed for several years, I think it is the experience of most observers that the hope of more than relief is somewhat problematical.

Tuberculosis of the Pharynx.

This is a disease characterized by the development in the fauces of that form of ulcerative action which in the larynx is called tubercular laryngitis, or laryngeal phthisis. Without entering into a discussion, for the present, at least, of the true pathology of the disease, it is sufficient to say that what holds true in regard to the laryngeal disease is true also of the disease occurring in the pharynx. More extended notice of its pathology will be found in the article on laryngeal phthisis.

Perhaps a clearer conception can be obtained of this rare affection by the relation of the following case. I was called on the 2d of April, 1878, to Andover, N. J., to see in consultation with Dr. Jno. Miller, of that place, a case presenting the following history: Mrs. C. F. C., aged twenty-one. Her mother and sister died of consumption, her father and brothers living, and in good health. She had always been well, and had never been subject to any cough, catarrh, or throat trouble. She lived in a farming district, and her home surroundings were everything that could be desired as conducing to good health. On February 8th Dr. Miller had been called to see her, and found her

suffering from an attack of follicular pharyngitis, involving the soft palate and pillars of the fauces. There was deep submucous infiltration, the uvula being markedly enlarged. The fever was of a mild type, and pain very slight while the fauces were at rest, although deglutition was somewhat painful. She was able to be up, and assisted in the duties of the household. The doctor saw her but once in four or five days, and under treatment the disease gradually subsided, and by the 1st of March she was convalescent. On the evening of the 6th of March she was married, although at the time she was somewhat delicate, without being able to refer her symptoms to anything more than the slight discomfort which remained from the condition of the throat, and the somewhat slow convalescence from the follicular disease of the fauces. On the day following her marriage she was seized with a chill, followed by high fever. On the 8th Dr. Miller saw her again, and found her with a violent fever, high temperature, and rapid pulse; there was considerable pain referable to the fauces, deglutition was extremely painful, and there was a slight hacking cough. On inspection, the site of the original follicular inflammation of the fauces was found to have become the seat of apparently aphthous patches, extending over the soft palate and uvula and a portion of the wall of the pharynx. There was extreme prostration, and the patient was confined to her bed. Examination of the lungs failed to detect any morbid condition. From March 8th until April 2d the above symptoms continued, there was a considerable discharge of mucopus, and the cough became more irritating and persistent, the fever remained high, pulse rapid, and weak. Liquid food was taken in fair quantities, but the swallowing of solid food became so painful as to be rarely attempted. The voice was not at any time markedly impaired. On the 2d of April, eight weeks after the first symptom of throat trouble was manifest, and four weeks after the graver form of the disease of the fauces had set in, I saw her. I found her in bed, apparently well nourished, and not much emaciated, but presenting that peculiar facies which showed her to be suffering from some marked dyscrasia. There was a peculiar grayish pallor about the face and lips, while at the same time there was a hectic spot on each cheek; the skin was hot to the touch, and very dry; the tongue coated and parched; the breath hot, feverish, and rapid; axillary temperature, 105°; pulse, 120. The examina-

tion of the lungs showed marked dulness, with broncho-vesicular respiration in the right interscapular region; there were no moist râles heard in any portion of the lung, and the physical signs otherwise were not noticeable. On examining the fauces, with the tongue depressed, I at first merely saw the parts showing a uniform pallor throughout the whole region, and covered with a thick, tenacious, ropy mucus; but on the second and closer inspection I discovered that there was ulcerative action going on and involving the whole posterior wall of the pharynx, the soft palate and uvula on the right side, and extending to the hard palate, the palatine arch, and a portion of the soft palate on the left side. On the right side the palate was destroyed as far as the glosso-palatine arch, but so evenly and smoothly as almost to escape notice save from the lack of symmetry on the two sides. Examination of the larynx showed that the epiglottis, the ary-epiglottic folds, the arytenoid cartilages and commissure were thickened and involved in that peculiar form of ulcerative action which we all recognize as advanced laryngeal phthisis, the ulceration involving the false cords while the true cords were intact. The ulceration in the pharynx was peculiar and characteristic, and was unquestionably the same as that which, when occurring in the larynx, is called tubercular laryngitis, or laryngeal phthisis. The closest examination and comparison of the laryngeal and pharyngeal disease failed to show any difference whatever in the gross appearances; there was a superficial waste or destructive process going on, and at the same time there was almost total absence of any evidence of granulation-tissue, or attempt at repair. There was no well-marked line of demarcation; there was no depression of the edges, the depression of the ulcerated surface sloping off, as it were, toward its border, which was somewhat ragged and irregular; and there was no areola of inflamed membrane beyond the ulceration. Its surface was of a grayish color, but so also was that of the mucous membrane of the whole fauces, and the general coloration was not markedly different in the healthy and diseased portions. The diseased surface was coated with a slimy, ropy mucus which is peculiar to phthisical ulceration; we generally speak of it as muco-pus, but the pus-cells, however, are probably comparatively few in number, and it is mainly composed of mucus and the débris of the wasting process, covering and adhering to the ulceration, and

partially concealing or masking it. It is detached and voided with considerable difficulty.

Fraenkel likens the surface of a phthisical ulceration to cut bacon; Laboulbène to the track of an earth worm in moist sand; it is difficult to describe it, but when once seen it is unmistakable. The subsequent history of the case was simply that of futile attempts to arrest the disease, and partially successful attempts to relieve. She died on April 15th, the high temperature persisting to the last, rarely being reduced below 103°, though quinine was given freely.

This young lady, while in apparent good health, caught cold, which resulted in an attack of acute follicular inflammation of the mucous membrane of the soft palate; under simple remedies the attack was subsiding, when there was suddenly manifested the fatal diathesis, which had carried off her mother and two sisters, and which was a perpetual menace to her, during her whole life, viz., the tubercular diathesis. Under its influence the inflamed follicles which were undergoing resolution, now took on ulcerative action, and the typical waste set in which characterizes the disease. There was now manifested a very grave, general condition, and yet there was no local manifestation of this more than an ulcerative process, of moderate extent, in the fauces. The general febrile motion and its accompanying symptoms indicated something more than a mere local disease; it was a systemic condition which arrested the progress of resolution which was going on, and destroyed the *vis medicatrix naturæ*, and so far dominated the reparative processes, as to utterly change their character and substitute in their place a destructive process. The local disease and the blood condition progressing, the patient finally succumbs, and dies with exhaustion from acute miliary tuberculosis.

We may generalize as follows: during the course of a general or pulmonary tuberculosis, but more frequently as a primary manifestation of a general dyscrasia or diathesis, there sets in upon the pharynx, soft palate, or neighboring parts, an ulcerative process presenting the appearances described, in the case above presented, and which we called phthisical or tubercular ulceration. There is severe pain always, and often of a most acute and lancinating character. The discharge is not purulent, but a dirty, grayish muco-pus. There is, as a

rule, high fever from the onset, the temperature ranging from 103° to 106°; this is a persistent and continued fever, not controllable by quinine. The tendency of the ulceration is to extend laterally and also very soon to the larynx; for I find no report of any case in which laryngeal disease has extended to the pharynx. The course of the disease is rapid; this is especially the case if the pharyngeal ulceration is primary. In this case death ensued from exhaustion in from six to eight weeks. If the pharyngeal disease is secondary to pulmonary tuberculosis, the fatal termination may be postponed from four to six months or even longer. The diagnosis is quite simple to one familiar with the laryngoscopic appearances in laryngeal phthisis in the ulcerative stage, yet so careful an observer as Fraenkel made the mistake of placing patients suffering from this disease under anti-syphilitic treatment; not only failing to benefit them, thereby, but on the contrary, doing them absolute harm.

The only other affection with which it may be confounded is strumous ulceration. Grouping the prominent characteristics of the three forms of ulcerative action, we will find that they present marked differences.

Syphilis.	*Phthisis.*	*Scrofula.*
Deeply excavated.	No apparent excavation.	No excavation.
Deep red, angry-looking areola.	No areola.	No areola.
Sharp cut edges.	Somewhat irregular, not sharp cut.	Everted and raised edges.
Well marked line of demarcation.	Line of demarcation not distinct.	Line of demarcation well shown.
Yellow purulent discharge.	Grayish, semi-opaque, ropy mucous discharge.	Muco-purulent discharge.
Profuse discharge.	Slight discharge.	Slight discharge.
Rapidly destructive.	Moderately active destruction.	Very slowly destructive.
Erodes deeply.	Extends laterally and superficially.	Very slowly and in all directions.
No general dyscrasia.	Marked general dyscrasia.	Strumous habit well marked.
No fever.	High fever.	No fever.

Treatment.—From what has been said it will be inferred that treatment is of little avail. Our effort will be mainly to correct, as far as possible, the general habit, to alleviate

symptoms, and to control, if possible, the extension of the ulcerative process.

In carrying out the first indication the same rules should be followed as govern the management of a case of pulmonary consumption. To relieve pain and cough, anodynes should be administered quite freely. To control the ulcerative action, and thus to alleviate the more distressing features of the disease, it is probable if treatment is commenced sufficiently early, that much may be done, by topical applications. The first indication is to thoroughly cleanse the ulcerated surface of its adherent mucus, by the use of some mild alkaline solution, such as a solution of borax, bicarbonate of soda, or bicarbonate of potassa, gr. v.–x., in an ounce of water. To this there may be added, with benefit, carbolic acid, gr. j.–iij. to ʒ j. This should be applied by means of an atomizer. A syringe, probang, or even the camel's-hair brush, being not only irritating, but also failing to thoroughly cleanse. After the parts are cleansed, there should be applied iodoform as the most certain and efficient of all our remedies in controlling all forms of ulcerative action. The iodoform may be applied pure or lightened by the addition of powdered starch or lycopodium. There should also be added morphia, gr. ij.–ʒ j., for its local sedative effect.

An efficient combination will be found as follows:

℞. Morphiæ sulph. ..... gr. vi.
Iodoformi ..... ʒ ij.
Pulv. amyli ..... ʒ j.
M.

This should be thoroughly triturated so as to form a fine, smooth powder.

In making the application, the powder blower shown in Fig. 47 should be preferred; as in this manner a thin, even film may be deposited on the diseased surface, and the irritation avoided which would be caused by piling too much of the remedy on the parts. In the absence of the insufflator, a quill or glass tube may be used, a very small quantity of the powder only being blown on at a time. Caustics or any irritating applications are to be avoided, as not only failing to do good, but as adding greatly to the suffering of the patient.

The food and drink must be selected with recognition of the fact that they pass over and come in contact with the diseased surface, and hence should be as bland and unirritating as possible. Counter-irritation is of very doubtful benefit, and undoubtedly adds to the discomfort of the sufferer. Steam inhalations are not only of no service, but they are liable to do mischief in promoting relaxation of the parts and increasing the discharge.

CHAPTER X.

NEUROSES OF THE PHARYNX.

Herpes of the Pharynx, or Herpetic Sore Throat.

This is an extremely rare affection compared with the frequency with which herpetic eruptions are met with on the external surface of the body, and yet that we do meet with a genuine herpes in the fauces is unquestionable. It consists in the development in the mucous membrane of an eruption presenting all the appearances of true herpes, and attended with certain symptoms, both local and constitutional, which render it analogous to herpetic eruptions on the skin. I have met with half a dozen cases of this affection in a somewhat exceptionally large experience in throat diseases, which leads me to regard it as a rarer affection than is usually supposed. In three of the cases which I have seen, the eruption showed itself in the form of herpes iris, that is, there was developed in the mucous membrane small rings of minute papules, partially or completely enclosing a tract of healthy membrane. In one case that I met with, the small papules seemed to arrange themselves somewhat irregularly in the mucous membrane of one side of the fauces; in another case they seemed to form a line along the junction of the hard and soft palate. These papules manifested no tendency to the complete formation of vesicles; but consisted in minute red points in which the membrane was raised above the surface very slightly, and seemed somewhat pointed or acuminated.

As to what especial condition gave rise to the eruption I am somewhat uncertain, but am disposed to regard it as a localized inflammation of the papillæ of the sub-epithelial layer of the mucous membrane, originating probably in the terminal filaments of the nerves. In those cases in which it took the form of herpes iris, the rings were somewhat irregular in out-

line ; not perfectly continuous, yet approximating sufficiently to an iris-like ring to warrant the name of herpes iris. The eruption in all the cases that I have seen has been on the soft palate and uvula ; and, furthermore, it has always been confined to one side. The eruption was not a continuous one ; but the patches would make their appearance, and after a course of from five to ten days, would disappear, and recur again after an interval of perhaps a week, or even longer, sometimes remaining absent for months. The same was true of the individual points of eruption ; they showed a tendency to come and go independently of their fellows. The prominent symptoms to which they give rise are more or less pain, referable to the faucial region, constant and annoying in character, with pain in swallowing, and a general sense of discomfort about the throat, attended oftentimes with a most intolerable sense of itching. The appearances are such as already noticed. Minute spots and papules, stand out prominently as to color, showing a deep purplish red, in contrast with the healthy mucous membrane surrounding them, always on one side of the throat, and scattered irregularly, or arranging themselves in the form of rings, as in herpes iris.

Treatment.—I am disposed to believe the affection is a constitutional one, and that its successful management depends on the internal administration of remedies. The patients usually present decided evidences of the nervous temperament. They are subject to neuralgias, or, possibly, hysterical symptoms, and present all the evidences in appearance and history which go to make up what we call the nervous disposition. They are also liable to show evidences of impaired general health. They are anæmic or chlorotic, and hence require decided tonic remedies.

The plan of treatment which I have pursued has been the administration of cod-liver oil, barks, and iron, in connection with arsenic. This should be given for a considerable length of time, certainly until the general health has been fully restored, the object being kept in view of relieving from the immediate attack, and of preventing any recurrence of the affection. In addition to the general treatment, certain local remedies may be used in order to give relief to the pain and intolerable itching to which the affection gives rise. For this purpose I have usually found the best relief from a gargle of

carbolic acid, ten grains to the ounce, or even stronger, if necessary. This remedy, as we know, acts as a local sedative in addition to its other properties, and it is this effect that is obtained by its use in herpetic sore throat.

Hystero-Neuroses of the Fauces.

A degree of prominence has been given of late years to the existence of certain reflex nervous symptoms referable to the upper air-passages, but dependent on morbid conditions of the uterus and its appendages. Valuable contributions, recording a number of carefnl clinical observations, have been made on the subject by Echeverria, Holden, Englemann, Cutter, and others, which serve to establish the fact of a close intimacy between the two parts, and that a morbid condition of the pelvic organ or its appendages, may give rise to more or less distressing symptoms referable entirely to the fauces. Moreover, a close examination of the air-passages fails to detect any morbid condition, and faithful topical medication fails to afford any relief to the symptoms complained of.

The symptoms, as a rule, are not such as would be caused by an organic or structural change in the part, but rather such as might be of a purely neurotic origin. The voice is not affected, there is no excess of the normal secretion of the part, nor is there any impairment of function. There is usually a cough present, but it is of a dry, irritative character; a more or less constant hacking. The prominent symptom, however, as a rule, is pain. This is never of a lancinating character, but is rather a dull aching, referable to the pharynx and pillars of the fauces, and often extending to the angle of the jaws. It also varies very much with the feelings of the patient, being aggravated as the result of fatigue or weakness from any cause. Occasionally these symptoms are aggravated by the approach or onset of the menstrual flow. In the majority of cases, however, this symptom is not present.

If the symptoms are referred to the larynx, the cough becomes prominent, assuming a stridulous and oftentimes spasmodic character, the voice being still unimpaired.

The bronchi also occasionally become the seat of reflex neurotic symptoms, in which case there occurs a spasmodic cough,

attended with marked dyspnœa. These attacks generally occur at night, and are attended with all the symptoms of genuine spasmodic asthma.

The uterine conditions which may give rise to these reflex symptoms embrace flexions, displacements, ulceration and inflammatory affection of the uterus, and also inflammation and displacement of the ovaries. In short, it may be stated that clinical observation demonstrates the existence of such an intimate sympathy between the throat and pelvic organs, that any morbid condition occurring in the latter may give rise to certain symptoms which the sufferer refers entirely to the upper air-passages, and in which the manifested and observed symptoms also belong to these parts. And, furthermore, that while measures directed to the air-passages are totally unavailing to give relief, the recognition and proper treatment of the morbid condition of the uterine organ serves to afford entire relief to the respiratory symptoms. An inspection of the throat, of course, in this affection, is entirely negative, and fails to reveal any morbid condition. And, moreover, there is no method by which, from an examination of the throat, we can recognize the fact that symptoms referred to that part are due to a diseased condition in the pelvic organs. It simply remains therefore for us, in cases such as described, when a laryngoscopic examination fails to reveal the cause of the symptoms, to bear in mind this possible other source for them. This further investigation discovering the true cause of the troublesome symptoms, the indications for treatment are clear ; the uterine disease must be treated.

The age of the patients in whom these neuroses are liable to occur is from fifteen to forty-five, that is during menstrual life. They occur also alike among married and unmarried women. These patients, moreover, are not necessarily of a hysterical character, although, as a rule, they possess something of a nervous temperament.

DISEASES OF THE NASAL CAVITY.

CHAPTER XI.

CATARRHAL AFFECTIONS OF THE NOSE.

ANATOMY.—The nasal cavities are two wedge-shaped cavities extending from the nostrils, in front, to the posterior nares, two oval-shaped openings, by which they communicate with the pharynx. The roof of these cavities is narrow and somewhat arched, and is formed by the nasal, the ethmoid, and the sphenoid bones. The floor is formed by the palatine processes of the superior maxillary and palate bones. They are separated from each other in the median line by the septum, which provides a smooth inner wall to each cavity, and is formed by the perpendicular plate of the ethmoid and the vomer posteriorly, and by the cartilaginous septum anteriorly. The outer wall of each cavity is formed by the superior maxillary and palate bones, and is traversed antero-posteriorly by three scroll-shaped bones, the turbinated, which serve to markedly increase the surface over which the

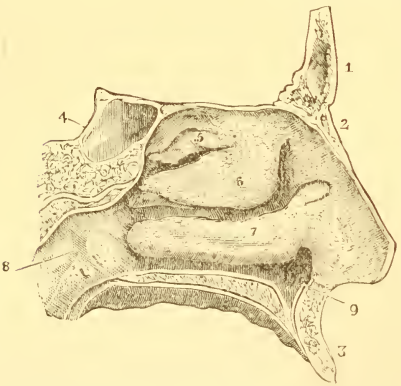

FIG. 86.—Outer wall of the left nasal cavity: 1, frontal bone; 2, nasal bone; 3, superior maxilla; 4, body of the sphenoid; 5, superior, 6, middle, and 7, inferior turbinated bones; 8, orifice of the Eustachian tube.

mucous membrane lining the cavity is displayed, and also to divide each fossa into three incomplete passages, the superior, middle, and inferior meatuses. This is well illustrated in Fig. 86, which shows the outer wall of the left nasal fossa. The transverse section shown in Fig. 87 still further illustrates the conformation of these cavities with the arrangement of the turbinated bones.

In this connection reference should be made to the accessory cavities which communicate with the nasal fossæ, and which are oftentimes involved in morbid processes which have their origin in the nasal cavities.

The antrum of Highmore (Fig. 87, 9), the largest of these accessory cavities, is a triangular-shaped cavity, hollowed out in the body of the superior maxilla. Its roof is formed by the floor of the orbit, and its inner boundary is formed by the outer wall of the nasal cavity. It communicates with the nares by an irregular shaped opening into the middle meatus.

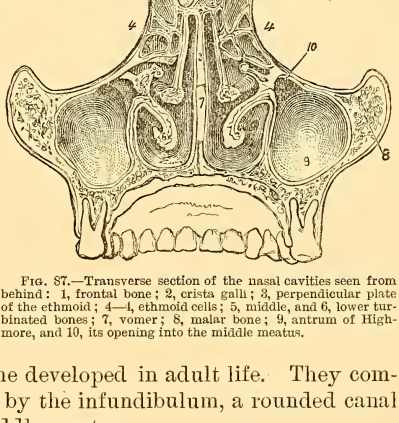

FIG. 87.—Transverse section of the nasal cavities seen from behind: 1, frontal bone; 2, crista galli; 3, perpendicular plate of the ethmoid; 4—4, ethmoid cells; 5, middle, and 6, lower turbinated bones; 7, vomer; 8, malar bone; 9, antrum of Highmore, and 10, its opening into the middle meatus.

The frontal sinuses (Fig. 86, 1) are two irregular cavities which lie between the two tables of the frontal bone. They are absent in childhood, but become developed in adult life. They communicate with the nares by the infundibulum, a rounded canal which opens into the middle meatus.

The sphenoidal sinuses (Fig. 86, 4) are two cavities hollowed out in the body of the sphenoid bone, and separated from each other by a thin lamella of bone. They communicate with the nares by small openings in the superior meatus.

The lachrymal duct enters the nasal cavity by a small opening in the inferior meatus, beneath and somewhat covered by the overhanging inferior turbinated bone.

The mucous membrane lining the nose is continuous with that of the pharynx, and extends into the Eustachian tubes and the accessory cavities. Its superficial layer is composed of tesselated epithelium in the upper portion of the cavities, as low as the middle turbinated bone and the upper third of the septum. The remaining portion of the lining membrane is endowed with columnar ciliated epithelium. This fact becomes of some importance in connection with those diseases of the cavity which act to destroy or impair the vibratory motion of the ciliæ, as this function undoubtedly has an influence in promoting the movement of mucus and facilitating its discharge; hence, therefore, its abolition increases the tendency to an accumulation of the discharges in diseased conditions.

This lining membrane possesses a considerable degree of thickness, which has the effect to reduce materially the size of the cavities; especially is this thickness of the membrane noticeable over the convexity and under surface of the turbinated bones, more markedly the lower and middle. This is due largely to the rich distribution of follicular glands with which the membrane of the nose is endowed, and which group themselves to an extent in these localities. In addition to this there is found in the deep layer of the membrane, over the convexity of the turbinated bones, a plexus of blood-vessels which is so rich in its distribution as to give to the part something of the character of an erectile tissue.

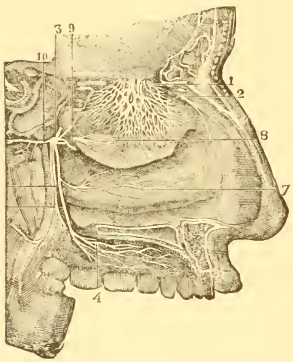

FIG. 88.—Nerves of the outer wall of the nasal cavity. (Hirschfeld). 1, network of the olfactory nerve; 2, branch of the nasal nerve; 3, spheno-palatine ganglion; 4, anterior palatine nerve, supplying the hard palate; 7, 8, 9, branches of the spheno-palatine ganglion, distributed to the middle and upper turbinated bones; 10, Vidian nerve.

The nerve supply (see Fig. 88) is derived from the olfactory, the Vidian, the naso-palatine, the nasal branch of the ophthalmic, and the anterior dental branch of the superior maxillary.

The olfactory nerve supplies the nasal cavity with the special sense of smell. It pierces the cribriform plate of the ethmoid bone by from fifteen to eighteen branches on each side, which are distributed to the membrane covering the superior and

middle turbinated bones and the upper third of the septum, terminating in minute, thread-like filaments which pass to the surface of the membrane between the epithelial cells (see Fig. 89). That portion of the nasal cavities to which the olfactory nerve is distributed is called the olfactory tract, while the lower portion, including the middle and inferior meatuses, is called the respiratory tract. The entrance to the nose anteriorly is guarded by a number of stiff hairs or vibrissæ, whose object is to prevent the entrance of particles of dust or other impurities in the inspired air.

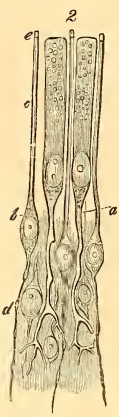

FIG. 89.—Method by which the thread-like terminal fibres of the olfactory nerve make their way to the surface of the mucous membrane, between the epithelial cells; *a*, epithelial cell; *b*, olfactory cell; *c*, the terminal thread-like fibre; *e*, the extremity of the fibre, composed of minute hair-like filaments.

PHYSIOLOGY.—The nose has a threefold function to perform in the economy. It is the organ which presides over the sense of smell; it has a special duty to perform in respiration; and it gives a certain character and resonance to the voice.

The sense of smell.—Minute particles of odorous bodies, floating in the atmosphere, are drawn into the nasal cavity with the act of inspiration, where, being arrested, and lodging against the moist membrane of the olfactory tract, they are dissolved in its mucus, and in this state of solution, coming in contact with the terminal filaments of the olfactory nerve, their peculiar qualities are recognized and appreciated. The proper enjoyment of this function requires that the membrane shall be in a moist condition, that it shall not be clogged by any accumulation of unhealthy mucus or other matters, and that the nasal cavity shall be freely open, and not occluded by tumors or other morbid conditions, but that the inspired air shall have free access to the olfactory membrane; and, furthermore, that the olfactory nerve shall be in a healthy condition.

Respiration.—The nasal cavities form an important part of the upper respiratory passages, it being the design of nature that respiration shall be carried on through them rather than through the mouth. In breathing through the nose the inspired air becomes warmed by the blood-warm walls of the longer and more tortuous passage through which it makes its

way to the lungs; it becomes charged with moisture absorbed from the lining of the tract which it traverses; and it becomes purified, in that the particles of dust and other matters which it may contain, are arrested by the vibrissæ which stand guard over the entrance to the nostril, and also by the moist surfaces against which they impinge, and to which they adhere. In breathing through the mouth, on the other hand, the inspired air reaches the lungs in a cooler, drier, and less pure condition, and hence one in which it is more irritating to the delicate structures of that organ.

The voice.—The function of the nasal cavity in modifying the voice is one of some importance, and consists simply in acting as a resonant chamber as it were. The voice is formed by vibrations of a column of air set in play by the movements of the vocal cords; its pitch being regulated by their tension; its volume being dependent on the force with which the current of air is driven through the rima glottidis, and hence, of course, by the lateral reach of each cord in a single vibration. The character of the voice, on the other hand, or the tone by which each voice is given its individuality, is dependent largely on the nasal cavity, the pharynx, and the mouth. The larynx simply forms the voice, articulate language being constructed out of the vocal waves by the movements of the soft palate, tongue, lips, etc.

In uttering certain sounds, the soft palate is raised against the wall of the pharynx, and the nasal cavity is more or less completely shut off. This occurs in the utterance of *a*, *i*, *o*, etc. In the utterance of other sounds the palate is relaxed, and the air in the nasal cavity, as well as that in the mouth, is thrown into vibration, giving a nasal twang to the voice; this occurs in uttering *n*, *m*, etc. A good voice is dependent on the proper use of both the nasal and oral vibrations, and therefore requires that the nasal cavity shall be free from obstruction (by tumors, hypertrophy of its lining membrane, etc.), and that the movements of the soft palate shall not be interfered with.

Anatomically, the nasal cavities are defined as extending from the nostrils to the posterior nares which open into the pharynx. Pathologically, however, we find that catarrhal diseases, both acute and chronic, involve not only the nasal cavities proper, but also the vault of the pharynx; hence, in treat-

ing of those affections which are embraced under the general head of catarrhal inflammations in the nasal cavities, it should be understood that the parts involved in the morbid process include also the vault of the pharynx.

'If we glance at a sectional diagram of the head, it will be seen that the border of the soft palate marks the boundary line between two avenues of the upper air-passages which are totally distinct and separate, both as regards their function and the influence of their surroundings. In that portion below the border of the palate we have a region which is being constantly impinged upon and swept by the passage of food and drink, the result of which is necessarily that an accumulation of mucus is prevented, the surface of the membrane is kept comparatively clean, and the mouths of the follicles are kept open. On the other hand, we find that the region which is above the border of the soft palate is subjected to entirely different influences. It is traversed by the current of air in respiration, and virtually nothing more. It of course is endowed with certain functions in phonation, and is also the organ of the sense of smell; but in this respect, for the present, it does not concern us. It is lined with a mucous membrane richly endowed with glands, and there is constantly going on a secretion of mucus, together with an evolution of epithelium in the process of growth. Nature has provided but one method by which this accumulation is gotten rid of; the epithelial cells are endowed with ciliæ, by which the mucus and worn-out epithelium are carried toward the outlets of the passage.

The essential difference between the two regions, therefore, lies in the fact that the lower pharynx is constantly traversed and impinged upon by solids and fluids, while the upper passage is only traversed by the current of air in respiration. Hence the lower region is kept comparatively clear of accumulations, while in the upper region the mucus secreted and the worn-out epithelium tend to accumulate in the sinuous passages, and remain in contact with its lining membrane. Especially is this true if, as the result of chronic inflammation, the ciliæ with which the epithelial coat of the membrane is endowed be destroyed. As the result, therefore, of this marked difference of function and environment, it seems to me a fair conclusion that the true boundary line between these two regions should be drawn at the border of the palate. The point, there-

fore, which I would make is, that whatever the anatomical division may be, the true nasal cavity is the one I have described, and extends from the nostril to the border of the soft palate, and includes what we usually call the vault of the pharynx. This division is justified by the physiological division of the parts, as I have said; furthermore, and more prominently still, it is the division which, from a pathological point of view, must be made.

The Vault of the Pharynx.—Regarding the pharyngeal vault as belonging, in a pathological point of view, to the nasal cavity, a brief reference to its anatomy is here given. The

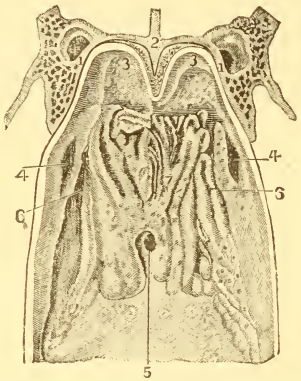

Fig. 90.—View of the vault of the pharynx with the fissured appearance of its glandular tissue. After) Luschka.) 1, pterygoid process; 2, vomer; 3, posterior portion of the roof of the nasal cavity; 4, orifice of the Eustachian tube; 5, mouth of the pharyngeal bursa; 6, fossa of Rosenmüller; 7, irregularly fissured surface of the glandular tissue which lifts up the mucous membrane into a number of low elevations. (Ziemssen.)

main interest which attaches to this region lies in the fact that we find displayed there a large aggregation of follicles and glands, which is so extensive, that it is usually spoken of as the "pharyngeal tonsil." In structure and function it is closely allied to the faucial tonsil, its minute anatomy being the same as the latter organ, with the only difference that it is not enclosed in a separate investing membrane. These glands seem to arrange themselves in elongated masses or ridges, separated by deep fissures, whose general direction is from above downward. In the lower portion of the pharyn-

geal tonsil there is often seen a small rounded orifice which marks the outlet of a small flask-like pouch, the pharyngeal bursa. This orifice is not always well marked, but I have repeatedly observed it in the living subject. The mass is bounded laterally by the fossæ of Rosenmüller, and above it terminates somewhat abruptly in a transverse fissure, beyond which the mucous membrane is smooth and closely attached to the parts beneath. The lower boundary shades off gradually into the smooth membrane of the lower pharynx, the ridges disappearing, the masses becoming smaller, until there is noticed only the few scattered, rounded follicles seen by direct inspection below the border of the soft palate.

Fig. 91.—Antero-posterior section of the glandular structure of the vault of the pharynx, somewhat larger than normal. (Luschka.)

This pharyngeal tonsil is not well marked in all cases, and in many it is so slightly developed as scarcely to be noticeable. In these cases there is seen simply the rounded, dome-like cavity of the vault, lined with a smooth, unbroken mucous membrane. In Fig. 90 there is shown the condition ordinarily observed when this organ is fairly well developed. Between this condition and one in which the pharyngeal tonsil is wanting we meet with it in all degrees of development. In Fig. 91 there is shown a section of the pharyngeal vault which has been drawn somewhat larger than the normal size.

Acute Coryza, or Ordinary Cold in the Head.

This is an acute inflammation of the mucous membrane lining the nasal cavities proper, and not infrequently extending to the pharynx and the accessory cavities, as the frontal sinus, the sphenoidal sinus, the antrum of Highmore, and also the lachrymal duct. In the large majority of cases it is caused by exposure to cold, though it is occasionally due to the inhala-

tion of acrid vapors or other irritants. In rare cases it occurs in those possessing idiosyncrasies by which a coryza is induced by the inhalation, in one case of particles of ipecacuanha, in another by iodine, etc. It also occurs at the onset of certain of the exanthems, as measles, etc. That exposure to cold should result in a coryza so much more frequently than any other affection is probably due to the fact that the nasal membrane, on account of its exposed situation, is the site of a mild chronic inflammation in many cases when it is not suspected by the individual, giving rise as it does to scarcely any noticeable symptoms, more than this disposition to take cold easily.

The attack is not usually ushered in by a chill, but rather by chilly sensations, with a feeling of lassitude and general malaise, followed by a mild febrile motion, with pains in the muscles and loss of appetite. Following this there is soon experienced a sense of burning or prickling in the nose, a feeling of dryness and heat, which may last a few hours or more, when there sets in a watery discharge of a somewhat acrid character, which gradually changes to a mucous discharge more or less copious in amount, and this in time yields to a free discharge of a purulent character. The duration of the attack varies from three days to a week, and undergoes apparently complete resolution, although undoubtedly, if no measures are adopted for the control or limitation of the inflammatory process, there is left behind a condition which invites renewed attacks from a slighter exciting cause.

The dryness of the membrane which characterizes the onset of the attack is coincident with the stage of congestion and arrest of secretion which marks the commencement of any acute inflammation of a mucous membrane. Following this there occurs a free transudation of liquor sanguinis from the engorged blood-vessels, which supplies the serous discharge which constitutes the main portion of the earliest secretion which is poured out. The normal glandular structures of the membrane are soon stimulated into an excessive and morbid activity, and a profuse discharge sets in, consisting of mucus and epithelial elements, with an admixture of leucocytes, and a few red blood-corpuscles. As the disease progresses the secretion becomes overcharged with young cells, which are generated with an increased activity, and assumes a purulent character.

If the nasal cavities proper are alone affected, the symptoms are mainly confined to the sense of discomfort referable to the nose, the increased secretion, the sense of fulness, or the complete occlusion, due to the swelling of the membrane, and the frequent and often distressing attacks of sneezing.

If the frontal sinuses are involved, there is often a severe frontal headache; if the tear-duct is involved, there is an overflow of tears, with marked irritation of the conjunctiva; if the disease extends to the antrum of Highmore, there is neuralgic pain referable to that region; if the Eustachian tube is involved, there is ringing in the ears, with impaired hearing. The sense of smell is generally lost for the time, and thereby also the sense of taste is impaired. The integument about the margins of the nostrils is often inflamed as the result of the irritating qualities of the discharge, which contains largely of saline matter. This is aggravated somewhat by the frequent use of the handkerchief, to which the sufferer is compelled to resort.

Prophylaxis.—Those who are especially liable to take cold should, of course, exercise an additional carefulness in the avoidance of those causes which experience teaches them may give rise to an attack of acute coryza; and yet an excessive zeal in this direction is to be avoided, since that over-carefulness for one's health, which results in muffling the head and neck with too much covering, leads to an over-sensitiveness of the parts, by which the liability to take cold is much increased. It is not well, as a rule, to wear thick wraps about the neck, unless it becomes necessary as a matter of comfort. Exposure to a cold temperature alone is not sufficient to produce a coryza; it is a draught of damp and chilly air which produces the mischief. This acts with a greater certainty of causing evil if the body is quiet and at rest.

The daily use of a cold douche over the neck and shoulders, or sponging with cold water, is a measure of great value in preventing attacks of cold in the head. This not only acts to keep the emunctory function of the skin in a healthy state of activity, but also serves to harden the parts, as it were, and render them less sensitive to the action of cold.

Of more importance still, as a preventive measure, is the removal of that condition which, as already suggested, is really the cause of this liability to take cold—the cure of the mild

chronic coryza which undoubtedly exists in these cases. At this time the affection is easily managed by very simple measures, and a condition removed which in many cases, at least, will eventually result in chronic nasal catarrh. The special remedies indicated will be noticed when we come to the consideration of chronic coryza.

Treatment.—An attack of acute coryza may often be aborted if measures are resorted to for the accomplishment of this purpose sufficiently early. This must needs be done very soon after the first local symptoms show themselves, and, as a rule, before the copious discharge has set in. The plan consists in the administration of from five to ten grains of quinine, followed by some warm drink, such as chamomile-tea, or a hot lemonade, with the addition, perhaps, of a hot foot-bath. The object of this, of course, is to produce a copious perspiration, and thus restore the animal heat which has been lost, and reestablish the proper equilibrium between heat-production and heat-waste. If there is much pain over the forehead or neuralgic pain in the face, due to involvement of some one of the accessory cavities, ten grains of Dover's powder may be given with advantage, both for the relief of pain and to aid in producing diaphoresis.

Cohen advocates warmly the administration of chloroform to the extent of producing anæsthesia, claiming that by this procedure a coryza may be aborted if the measure is resorted to at the onset of the attack. I have never made trial of this remedy, and cannot speak from personal experience of its efficacy.

After the discharge has set in, as it does in a few hours or a day after the onset of the attack, all that can be hoped for is to somewhat curtail the duration of the disease and limit the inflammatory action. I know of no better remedy for the purpose than the following, which was published in the *London Lancet* a few years ago :

℞. Morphiæ sulphat..... gr. ij.
Bismuth subcarbonat..... ʒ j.
M. Ft. pulv.

This may be used frequently through the day, a small portion being snuffed into the nostril every hour or two. It should

be borne in mind, however, that absorption from the nasal membrane is quite prompt, and that the constitutional effect of the morphia is obtained as well as the local, hence the amount used should be carefully noted. I usually prefer to order the above prescription to be divided into twelve powders, and direct that one shall be used every half-hour until very decided relief is obtained. The little powder-insufflator shown in Fig. 92 answers a very convenient purpose in these cases, enabling the patient to apply the powder thoroughly and effectively.

Fig. 92.—Powder-insufflator for self-use, with an opening in the upper branch through which the powder is inserted.

If there is much swelling of the membrane, with painful obstruction of the nares accompanied with frontal headache, much relief will be afforded by the inhalation of hot vapor. This serves to cause, as it were, a local diaphoresis, thereby relieving the distention of the vessels and promoting resolution. Chamomile flowers, poppy-heads, or hops added to the hot water serve an excellent purpose in relieving the pain, which is often a prominent symptom.

If the general diaphoresis which has been resorted to for the purpose of aborting the coryza fails, it is well to repeat it on the second or also on the third night, as much can be accomplished thereby in promoting a more rapid resolution of the attack.

The inhalation of the vapor of iodine has been recommended in acute coryza. Any catarrhal affection, whether acute or chronic, may be relieved temporarily by the use of an irritant, which stimulates the membrane to a copious discharge, thereby causing a temporary depletion, and hence, for the time, decided relief. It is, however, only temporary, and the advisability of the use of such remedies is, to say the least, doubtful.

As of iodine, so the same may be said of carbolic acid, creasote, ammonia, etc.

A remedy of much repute among the Germans, and known as Hager's remedy for a cold, is as follows:

℞. Acidi carbolici..... 3 j.
Alcohol fort..... 3 iij.
Liq. ammoniæ fort..... 3 j.
Aquæ destillatæ..... 3 ij.
M.

A few drops of the solution are to be sprinkled on a handkerchief, and inhaled through the nose as long as its strength lasts. This is to be repeated every two or three hours. I have occasionally made use of this remedy with excellent results, but generally prefer the *Lancet* powder. (Page 176).

Aqueous solutions of the various astringents, such as tannin, alum, zinc, etc., have been recommended, to be used in the form of spray, by the douche, and by insufflation. They are of benefit in the later stages of the affection, when the muco-purulent discharge has set in, and are especially to be recommended if the attack seems persistent and threatens to lapse into a chronic coryza. In this case a solution of tannin, gr. x.— ℥ j., alum, gr. v.— ℥ j., or sodæ biborat., gr. x.— ℥ j., may be used. The small atomizer shown in Fig. 63 is better for this application than either the nasal douche or the syringe. In the earlier stages of a coryza aqueous solutions are of doubtful benefit. The same may be said of insufflation of salt water, the smoking of cubebs, etc.

It is a tradition of old standing that a cold can be arrested by the abstention from drinking water for a period of forty-eight hours. I have never known of any one succeeding in accomplishing the desired result by this measure, and, moreover, I am disposed to doubt if any one has ever succeeded in faithfully carrying out the plan.

CHAPTER XII.

CHRONIC NASAL CATARRH.

This term is of very ancient usage, and is one which so much more completely defines the disease which we are now to consider than any other, that I prefer to retain it.

The more recent literature of the subject abounds with a large number of names which it seems to me only serve to confuse. As before intimated, whatever anatomical division may be made of the nasal cavities, from a pathological point of view, they may be defined as extending from the nostrils to the free border of the soft palate, including the upper pharynx. Chronic nasal catarrh, then, may be defined as a chronic inflammation of the mucous membrane lining the nasal cavities and the vault of the pharynx. This affection is often designated as naso-pharyngeal catarrh. I see no especial advantage in the use of the longer name. We also find it treated of under such varying terms as post-nasal catarrh, retro-nasal catarrh, post-pharyngeal catarrh, glandular hypertrophy of the vault of the pharynx, and follicular pharyngitis. It is also oftentimes the disease called clergyman's sore throat. I have never met with any of the above-named diseases in which the nasal cavity was not also involved in the morbid process. By this I mean, that while the disease of the pharynx may be so prominent as to lend reason to such a classification, still it is always attended with disease of the nasal mucous membrane, and the simple name of nasal catarrh more correctly describes it.

Nasal catarrh is met with in five varieties: 1. *Chronic coryza*—a chronic inflammation of the nasal membrane, characterized by an excessive discharge of mucus, but marked by no prominent structural changes. 2. *Hypertrophic nasal catarrh*—a chronic inflammation of the mucous membrane, characterized by an excessive secretion of mucus or muco-pus, and also

marked by certain structural changes in the membrane by which it is thickened or hypertrophied. This hypertrophy involves not only the membrane lining the nasal cavity proper, but also the glands at the vault of the pharynx. 3. *Atrophic nasal catarrh*—a chronic inflammation of the mucous membrane in which the glandular structures are involved in such a way as to seriously interfere with their function. As the result of this the membrane fails of its proper supply of mucus, and therefore becomes abnormally dry. This is the so-called dry catarrh. It is also designated often as pharyngitis sicca. 4. *Fetid catarrh*—a catarrh characterized by a fetid and offensive discharge, and which, in the large majority of cases, if not in all, is the direct result of the atrophic or dry catarrh. 5. *Ozæna*—properly a disease of the accessory sinuses, but manifesting its symptoms in the nasal cavities.

Chronic Coryza.

As the result of repeated attacks of cold in the head, or as a chronic affection from the onset, we find the nasal mucous membrane taking on a chronic inflammation, of which the prominent symptom is an increased secretion of mucus or muco-pus. This is voided or gotten rid of either by the frequent blowing of the nose, or by that peculiar nasal screatus by which the discharge is drawn back into the pharynx, and from thence is hawked up and expectorated. The discharge, as a rule, is thin, semi-fluid, and easily removed. It consists mainly of mucus, with a copious admixture of young cells and worn-out epithelium, which gives to it a somewhat purulent character. There is no marked thickening of the mucous membrane, and consequently no interference with normal nasal respiration. The discharge is fluid at all times, and the membrane soft and moist. There is, therefore, no tendency to dryness of the parts, or to the formation of crusts or inspissated masses. The secretions do not accumulate in the cavity, but are constantly being discharged, hence fetor, as the result of decomposition of the retained masses, is never a feature of the disease.

The voice is not affected, nor is the sense of smell impaired, the inflammatory process being probably confined in the main to the respiratory portion of the cavity, and not involving that

portion of the mucous membrane in which the olfactory nerve is distributed. Reflex sensibility of the nose is somewhat impaired, hence sneezing is not, as a rule, an accompaniment of the affection. The symptoms are somewhat in abeyance during warm weather, but are more or less prominent during the damp and chilly days of Spring and Fall. The disease is not one which gives rise to much annoyance, and does not often present for treatment, its main importance being in its tendency to go on, unless arrested, to the development of one of the later forms of catarrh.

Examination.—On inspection, anteriorly, that portion of the mucous membrane which comes under observation, viz., the anterior portions of the septum and the middle and lower turbinated bones, is seen to present a reddened and congested appearance, with something of a turgid and purplish look ; the surface is moist, and coated with more or less free, loose mucus. The cavity of the nose is not encroached upon to any marked extent, the space between the septum and the convexity of the turbinated bones being almost normal. On examining behind the palate, the same general appearance of the nasal mucous membrane will be seen, but the appearances of the upper pharynx are more noticeable. The rounded concavity of the vault will be seen, not encroached upon by any abnormal thickening or growths, but the mucous membrane will present a reddened and turgid aspect, its glands swollen somewhat, and their orifices clogged with a thick, tenacious mucus, which apparently hangs in masses from their mouths. This mucus is of a grayish opaque color, and is secreted in a considerable amount.

The main importance of the thorough examination in this disease lies, in being able to determine the simple character of the affection with reference to the measures of treatment to be adopted. If the examination fails to reveal any of the evidences of the later forms of nasal catarrh described farther on, the prognosis is rendered favorable and the treatment somewhat simple.

Treatment.—In this, as in other forms of catarrhal disease, the first step in the treatment consists in cleansing the part. For this purpose the post-nasal syringe is unnecessary, the object being to accomplish the desired end with as little irritation as possible. The syringe is somewhat harsh and irritating, and its use should only be resorted to when other and simple

methods fail. The better method of cleansing is by means of the atomizer with the compressed air apparatus. Failing these, the Richardson hand-ball spray (Fig. 61) serves an excellent purpose, or the little atomizer, shown in Fig. 63. For cleansing purposes there may be used, borax, gr. x.—℥ j., which may be improved somewhat by the addition of common salt, gr. xv.—℥ j. One of the best of cleansing solutions, however, is Dobell's solution, given in the appendix. In this affection care must be exercised that the application be not irritating, and if it is found that any solution is painful it should be reduced in strength. Bearing this in mind, use may be made of any of the cleansing solutions given in the Appendix. The application should be thrown through each nostril, and repeated until the cavities are entirely free from all mucous accumulation, and seen to be so by inspection. If the method of cleansing by making application through the nostrils fails to remove the mucus from the vault of the pharynx, the part may be reached by throwing the spray up behind the palate. For the accomplishment of this procedure the parts should be thoroughly relaxed, and the space between the palate and the pharyngeal wall open. Most patients involuntarily close this space the instant any attempt is made to manipulate in the fauces, so that the spraying from behind the palate is not easy of accomplishment. Cleansing must then be accomplished by the use of the syringe, or a sponge may be dipped in the solution and passed up behind the palate and the parts swabbed in such a manner as to thoroughly remove the accumulations. The parts having been cleansed the next step consists in the application of a mild astringent. The best of these is tannic acid, which may be used in the form of the officinal glycerole (℥ ij.—℥ j.), one part in eight of water. If there is much congestion of the membrane the mineral salts may be used with advantage, such as alum, ferric alum, or sulphate of iron of a strength not greater than four grains to the ounce. If these solutions are not well borne resort, may be had in the order of preference to one of the following: Potassæ chloratis, ʒj.—℥ j.; tinct. kino, ʒ j.—℥ j.; tinct. rhatany, ʒ j.—℥ j.; zinci sulphat., gr. v.—℥ j.

These can be applied best by means of the atomizer. That the medicated fluid thoroughly reaches the parts by this method is evidenced by the fact that a cloud of spray can be

seen issuing from the other nostril. This is one of the forms of catarrh in which powders do excellent service, their advantage being that they are dissolved in the secretions which are always fluid, and thus for some time remain in contact with the membrane, whereby their astringent action is prolonged. It should always be borne in mind, however, that the powders should be deposited in such a way that they become evenly distributed over the membrane. This is best accomplished by the use of the powder-blower, shown in Fig. 47. There may be used in this form any of the astringent remedies recommended to be used in solution, as follows:

℞. Acidi tannici..... ʒ j.
Pulv. amyli..... ʒ vij.
M.

Ferri et aluminis sulph..... ℈ j.
Pulv. amyli..... ʒ j.
M.

℞. Aluminis sulph..... ℈ j.
Pulv. amyli..... ʒ j.
M.

℞. Potass. chlorat..... ʒ ss.
Pulv. amyli..... ʒ j.
M.

℞. Ferri. sulphat..... ℈ j.
Pulv. amyli..... ʒ j.
M.

℞. Bismuth subcarb.,
Lycopodii.....āā ʒ ss.
M.

For the starch in the above prescriptions there may be substituted magnesia, lycopodium, pulv. acacia, or any light neutral powder.

In addition to the foregoing plan of treatment, which should be carried out at the hands of the physician at least twice each week, there are certain measures the patient may with profit carry out during the intervals of the visits to his physician.

The Weber nasal douche, which has been much abused for its inefficiency and for its dangers, may in this disease be used not only with entire safety, but with decided benefit, it being probable, as above remarked, that this affection is largely confined to the lower portion of the nasal cavity, and as the douche reaches thoroughly that portion of the cavity, we have every reason to suppose that the entire diseased membrane is bathed by remedies applied in this manner; hence, in treating a catarrh of this variety, it is well to direct the patient to use the nasal douche once a day. The fluid to be used may be one of the cleansing solutions given above, with the addition of a mild astringent, such as have been given. Occasionally it may be well to direct a snuff to be used in the intervals of treatment for this purpose. Any of those given above may be prescribed. These should be used with a powder blower in preference to being snuffed up in the ordinary method. Fig. 92 shows a convenient little instrument devised for this purpose.

The annoyance arising from this form of catarrh is often so moderate that patients are not disposed to place themselves under a regular course of treatment. In these cases it becomes necessary to suggest some simple plan which the patient can and will carry out faithfully. The nasal douche involves considerable trouble in preparation, and is often objected to. The atomizer shown in Fig. 63 involves but little trouble. It can be kept on the toilet table and used night and morning, and is quite an efficient instrument in these mild catarrhs. The remedy to be used in any case will easily suggest itself from what has already been said.

Hypertrophic Nasal Catarrh.

A mucous membrane having become the seat of an inflammatory process which has lapsed into the chronic state, the morbid activity is greatest, as we have already seen, in the deeper layers of the tissue; and sooner or later this results in a proliferation of all the normal elements of the membrane, giving rise to a true hypertrophy.

This tendency is more marked in the nasal cavity, perhaps, than in any other of the mucous tracts, and for several reasons. The nasal passages are composed of rigid walls, and are trav

ersed by the current of air in respiration, and virtually nothing more. The results of the inflammatory process therefore tend not only to accumulate in the superficial layer of the membrane, but also to infiltrate its meshes, the surface of the mucous lining being so entirely protected from attrition or pressure that the hypertrophic process is unimpeded. We find, therefore, that sooner or later a chronic coryza develops into the later form of the disease, which we designate as the hypertrophic form. This is the disease generally spoken of as nasal catarrh, and is the one which, in the very large majority of cases, presents for treatment when the morbid process has so far progressed as to demand relief for symptoms due to the nasal disease itself, or its resultant pharyngeal or laryngeal catarrh.

In the nasal cavity proper, the mucous membrane in a state of chronic inflammation which has advanced to the stage of hypertrophy, assumes a form somewhat different from that generally met with in the pharyngeal vault. In the nares, as we know, the lining membrane is not so richly endowed with glands as is the case with the lining of the vault of the pharynx. Hence, in chronic inflammation the morbid process shows itself in certain changes occurring in the mucous membrane proper. These changes consist in the deposit in the deep layers of the membrane of new connective-tissue elements, and an infiltration of the deeper layers with new cells. At the same time, in the epithelial elements there is a morbid activity in cell-growth by which this layer becomes abnormally thickened and hypertrophied. We have a true hypertrophy of the membrane involving all the normal elements of the part, the greatest activity, however, of the process being confined to the connective-tissue elements and epithelium. The glandular structures are involved also, but to a limited extent. The result of this process, in its influence on the normal function of the parts, is simply to increase the secretion of mucus, and give to it somewhat of a purulent character by the admixture of young cells with the discharge. This thickening does not occur in a smooth, uniform hypertrophy, but shows itself in a somewhat irregular, and in places nodular, appearance. Its usual site is on the convexity of the turbinated bones, and, in fact, in this locality the morbid process is developed in its greatest extent. The lower turbinated bone, as a rule, is more

involved than the middle, and the middle more than the upper. The membrane of the septum is also affected on one or both sides. The floor of the nares is not ordinarily involved.

Symptoms.—The prominent symptoms resulting from this condition are, an abnormal secretion of mucus or muco-pus, together with a narrowing or stenosis of the nasal cavity, giving rise to an interference with free nasal respiration. The membrane becomes also extremely irritable and sensitive to changes of the weather. The excessive discharge does not, as in acute coryza, make its way toward the nostrils anteriorly, but is drawn back into the fauces, whence it is hawked up and expectorated. It is frequently poured out in such an excess that it gives rise to a constant dropping in the throat, a symptom of which patients often complain, and which gives rise to no little annoyance and discomfort. The origin of this discharge has been attributed to the pharyngeal tonsil, and again to the sphenoidal sinuses, to the ethmoid cells, etc. The source of much of the discharge in this form of catarrh is unquestionably in the glandular structures at the pharyngeal vault, but its principal source is in the hypertrophied membrane in the nasal cavity proper. This I have frequently verified by the success in arresting it by measures of treatment directed to these parts alone. That the sphenoidal sinuses or ethmoid cells are involved in the disease, and become a source of abnormal discharge, is undoubtedly a mistake.

There is no tendency, as a rule, to the formation of crusts or inspissated masses, nor are fetid and offensive secretions an accompaniment of this form of catarrh. If such a symptom should be present it would be an evidence that some other form of the disease was to be dealt with. The secretion is greatly increased, and as the morbid process develops, becomes thick, ropy, and extremely tenacious, with more or less of an admixture of young cells which give it a semi-purulent character, its color being yellowish and opaque. This discharge passes down and lodges between the soft palate and pharyngeal wall, giving rise to much annoyance and irritation, with a feeling as of a foreign body in the throat, which the sufferer makes ineffectual efforts to remove by swallowing. Failing in this he resorts to a disagreeable nasal screatus, by which he endeavors to detach it, and draw it down into the lower pharynx. The outlying glands lower down on the pharyngeal wall, below the

border of the soft palate, are also involved in scattered groups. As the disease becomes more chronic, the lower pharynx becomes involved, not necessarily as a result of the direct extension of the disease, but from the excessive secretion which flows down over its surface, together with the deleterious influence of the oral breathing compelled by the nasal stenosis. This is aggravated somewhat by the violent efforts at hawking and clearing the throat, which become necessary on account of the mucus which accumulates there.

The discharge, passing down the wall of the pharynx, reaches the arytenoid commissure and passes into the larynx, giving rise, oftentimes, to a chronic laryngeal catarrh, as a result of the irritation thereby set up. Cough sooner or later sets in, of a more or less aggravated character and reflex in nature, being excited in the effort to clear the fauces of the irritating secretions. This, as a rule, occurs in the morning, when the secretions have accumulated over night, and during the prolonged abeyance of any voluntary effort to relieve the throat. The voice is affected somewhat in character and register, according as the laryngeal symptoms are pronounced. It is also affected somewhat by the extent of the hypertrophy occurring in the nasal cavity and vault of the pharynx, but only to the extent by which these cavities are encroached upon by the thickened membrane, and thereby the special vibrations interfered with, which give the voice its normal nasal character. Hearing may be interfered with by the hypertrophied tissues encroaching upon the orifice of the Eustachian tube, or by the inflammatory process extending into the tube. The extent of this impairment, of course, being dependent on the extent of the morbid process.

As a result of this hypertrophy the nasal cavity is encroached upon, and to such an extent often as to interfere with nasal respiration. This stenosis may be so great as to cause no little annoyance or distress to the sufferer. The membrane is also extremely irritable and sensitive to any changes in the weather; especially is it aggravated by a combination of cold and dampness, under the influence of which it seems to become swollen and puffy, as it were, thus increasing the difficulty of nasal respiration, and at the same time pouring forth a copious watery discharge mixed with mucus. This exacerbation of the ordinary symptoms is not so much due to taking

cold, as to the direct irritating influence of the damp atmosphere coming in contact with the membrane. In this it resembles somewhat the hygroscopic character of the gelatinous polypus of the nose. The symptoms of the disease during these exacerbations become not unlike an attack of cold in the head in other respects also, in that the swelling of the membrane may lead to a closure of the frontal sinuses, resulting in more or less intense frontal headache. The involvement of the antrum of Highmore may lead to facial neuralgia. There may be also sympathetic irritation of the eyes, etc.

Examination anteriorly.—If, now, we make an examination anteriorly, the nostril being dilated and the tip of the nose elevated, we see projecting into the cavity the anterior termination of the inferior turbinated bone, with its membrane thickened in such a manner as to encroach very decidedly on the normal breathing space of the passage. The membrane is reddened and congested, and is coated with more or less of a humid and watery discharge, and if the thickened tissue projects to such an extent as to touch the septum there may be noticed a superficial erosion at the point of contact. It is soft and somewhat doughy to the touch, and if indented with a probe recovers its convexity sluggishly. The septum presents a somewhat irregular aspect, projections being noticed which here and there destroy its normal smoothness of contour. The discharges as seen from the front, as a rule, in this form of catarrh, are still fluid mucus, though they oftentimes have a thick and ropy character.

If now the face of the patient be lowered in such a manner that the floor of the nares with the lower meatus can be brought into view, it will be seen that the membrane covering the lower turbinated bone seems to hang downward, thus encroaching on the lower passage. This may be the case to such an extent that the hypertrophied tissue lies upon or touches the floor of the nares. By throwing the head backward now, the middle turbinated bone can be easily seen, and if involved in the morbid process will present much the same appearance as the lower. It will be seen projecting toward, and oftentimes in contact with the septum. It generally presents a rounded mass to the view, and does not show the same tendency to project downward as is manifested in the lower turbinated bone.

Examination posteriorly.—If now the nasal cavity be inspected from behind, by means of the rhinoscopic mirror, confining the examination to the nasal fossæ proper, there will be brought into view, under ordinarily favorable circumstances, the superior and middle turbinated bones and the upper half of the lower turbinated bone with the larger portion of the septum. The membrane over these parts, as far as they are involved in the hypertrophic process, will be seen covered by a mucous membrane presenting appearances peculiar and characteristic. Over the turbinated bones the membrane is raised and projects prominently from the convexity, is somewhat whitened or blanched in appearance, of a whitish-gray color, with an irregular corrugated surface, its outline marked by seams or fissures. The appearance resembles that of a grub-worm in outline, color, and in the seamed appearance of the surface. This condition is most prominent over the lower turbinated bone, as a rule, but may be seen on the middle and upper. It is seen, in both cavities, though generally to a somewhat greater extent in one than in the other. The septum is also involved in the same process, and on inspection there will be seen bulging from either side the same peculiar thickening of the membrane which serves to encroach still further on the normal lumen of the cavity. This grub-worm thickening is characteristic and peculiar, and when once seen will always be recognized. It is the essential condition which constitutes hypertrophic nasal catarrh, and may exist to but slight extent, merely deforming the surface of the membrane and giving rise to a shallow thickening; or it may exist to the extent of encroaching very seriously on the nasal cavity. It is usually well marked on the middle turbinated bone, but far more so, as a rule, on the lower, which will be seen presenting a large, rounded, corrugated mass, encroaching on the posterior nares, and having the appearance of a tumor lying on the floor of the cavity.

Turning now to the vault of the pharynx, we find here a mucous membrane so richly endowed with glands that it is often spoken of as the pharyngeal tonsil. Here also, as in the nasal cavity proper, chronic inflammation results in a hypertrophy of the membrane, but of a different character, in that the glandular structures are mainly involved in the morbid process rather than the mucous membrane proper. The glands be-

come enlarged, their cavities distended, their walls thickened, and we have a true glandular hypertrophy characterized by a deposit of connective tissue in the deep layers of the membrane, and also in the coats of the glands, together with an increase in the epithelial cells and blood-vessels, and other of the normal elements of the tissue.

If now we examine this region by the aid of the rhinoscopic mirror, in place of the rounded dome-like cavity of the vault, which is seen in the normal healthy condition of the part, we shall find the mucous membrane thickened and nodulated, raised markedly above the surface in parts, and traversed by seams and fissures, the projections presenting small, rounded, turgid masses, gathered together in clusters. These may protrude so far as to present hemispherical bodies, or simple, small, rounded masses projecting and raised above the surface. In other places these elevations show themselves as elongated ridges, whose general direction is from above downward. The color varies from a rose color to a deep purple. In the upper portion a deep transverse fissure will be noticed, which marks the rather abrupt termination between the roof of the nasal cavity proper and the pharyngeal tonsil. In the lower portion, and in the median line, there will be generally noticed a small circular opening, the orifice into a small pouch, the pharyngeal bursa. The parts are generally seen to be covered with a thick pendulous mass of mucus, which seems to be entangled in the meshes of the glands, and hangs down between the soft palate and posterior pharyngeal wall.

Removing the mirror, and simply examining the lower pharynx by direct inspection, the mucous membrane will be seen reddened, somewhat thickened, and marked by small, scattered, and rounded eminences, which are the outlying follicles of the pharyngeal tonsil involved in the same hypertrophic process. They are grouped in the upper portion of the lower pharynx, and along the border of the pillars of the fauces. If the palate is touched, in order to excite a moderate reflex contraction, it is drawn up against the posterior wall of the pharynx, and there is seen lodged in the angle, beneath the uvula, the mass of ropy mucus which is protruding from the upper pharyngeal glands.

The treatment of nasal catarrh becomes of importance from a number of considerations. It is much to be deprecated that

in the milder and more tractable forms the sufferer so rarely seeks relief at the hands of the physician. The limited amount of the abnormal secretion which is discharged anteriorly, or is drawn back into the fauces and hawked up and expectorated, is merely the source of a moderate degree of annoyance during the Spring and Fall months, when the disease is somewhat aggravated by atmospheric conditions. During other portions of the year the sufferer is comparatively free from any trouble. At this time, then, the disease is only serious in its tendencies toward the development of the later and graver forms of nasal catarrh, or, possibly, other affections. In many cases the natural sequence of events may be predicted with considerable certainty as follows: the simple coryza gradually progresses to the development of hypertrophied tissue, both in the nasal cavity and in the vault of the pharynx, with the ordinary symptoms which accompany the disease; there is an excessive liability to take cold, and each exacerbation leaves behind it an increase of the chronic inflammatory process. The disease advancing to the lower pharynx and larynx, we find these organs involved in the acute attacks which recur with renewed frequency and on slighter provocation, and it soon becomes a not unusual occurrence that the trachea and larger bronchi become involved. While the general health is unimpaired, these attacks are readily thrown off, but there is always a danger that from impaired health or lowered vitality from any cause, an attack of bronchitis may occur, which is not recovered from with readiness, and that, eventually, a more permanent and graver trouble may occur in the lungs. That this is a possible sequence of events, and is one of the dangers of chronic inflammations in the upper air-passages, cannot be questioned, although it is undoubtedly true that a very large proportion of cases of nasal catarrh may exist for years without extending to the lung-tissues.

Treatment.—In this affection the secretions accumulate not only on the face of the turbinated bones, but in the sinuosities of the cavities, and being of a thick and ropy character often, they form a shield to the parts which, unless it is removed, completely bars the access of topical agents. In the failure to recognize this fact we have possibly a partial explanation of the frequent inefficacy of local treatment in the management of the disease.

It is of the first importance, then, that the membrane shall

be thoroughly cleansed of its mucus as the first step in treatment, and before the especial remedy is applied whose local action it is desired to obtain. If the disease is moderate in extent, and the secretions thin, fluid, and easily detached, this may be accomplished by the use of the atomizer, the current being thrown into the nostril. The Richardson spray (Fig. 61) or the small atomizer shown in Fig. 63, will accomplish this quite efficiently; but in ordinary cases a far more satisfactory means is by the use of the compressed air apparatus with Sass's tubes, the spray being thrown in first at one nostril, then at the other, each application being followed by the moderate blowing of the nose. By this method the whole nasal cavity, as also the vault of the pharynx, is thoroughly flooded with the medicated fluid. If, however, the hypertrophic process has advanced to the extent of producing a marked narrowing of the nasal cavity, the application to the pharynx through the anterior nares is rendered more difficult. We must then have resort to the upward spray, shown in Fig. 62, by which the cleansing fluid is thrown into the nasal cavity from behind the palate. This, however, is a somewhat difficult procedure, as the proper control of the movements of the palate is essential for its accomplishment, and, as a rule, patients are unable to properly manage this, and, as has been said before, palate-retractors are not well tolerated. We are then compelled to resort to some measure of cleansing, in the accomplishment of which lack of training on the part of the patient does not interfere. The post-nasal syringe shown in Fig. 54 answers this purpose, in that its beak is easily passed behind the palate in whatever position the fauces may be, and its contents delivered in such a way as to thoroughly and effectually bathe the lining of the whole nasal cavity and vault of the pharynx. The essential feature of any method of cleansing of the nasal cavity is that the solutions shall thoroughly reach the parts with which they are intended to come in contact, and also that they shall reach them in such a manner as to completely detach the mucus which there exists. In mild cases of nasal catarrh, the anterior nasal cavity is quite patulous, and the spray apparatus accomplishes this purpose very satisfactorily; but in those cases, in which the cavity of the anterior nares is encroached upon by hypertrophied tissue, we have no resort that approaches in efficiency the use of the post-

nasal syringe for cleansing purposes. In Fig. 55 there is shown the nozzle of this syringe, which may be attached to the Davidson or fountain-syringe, and used for the same purpose. It oftentimes becomes necessary, however, to throw the fluids with a degree of force, which can only be secured by the use of the barrel-syringe. As regards the use of the Weber douche for cleansing in the treatment of this form of nasal catarrh, its inefficiency has been sufficiently alluded to in a previous chapter. The fluids to be used may be any of those given in the Appendix. The Dobell's solution (Prescription No. 1) I have always found by far the most useful. Occasionally it gives pain, in which case it may be diluted, or the amount of carbolic acid lessened.

After the parts are thoroughly cleansed they are ready for the next procedure, which consists in the application of such astringent or resolvent as may be especially indicated. The special remedy decided upon is best applied in the form of spray, and, as has been said above, Sass's spray-tubes with the compressed-air apparatus furnish the most efficient means we have of reaching thoroughly the whole cavity. This apparatus not being at hand, resort may be had to the Richardson's hand-ball spray.

If the disease is moderate in extent, and not attended with any marked degree of hypertrophy of the membrane, complete resolution may be accomplished by the application of aqueous solutions. For this purpose there are very few of the various astringents of the pharmacopœia but have been used. Without enumerating these in detail, there are given in the order of preference such as have been found beneficial in these cases: sulphate of zinc, gr. v.—x. to ℥ j., chloride of zinc, gr. ij.—vj. to ℥ j., tannin, ʒ ss.— ℥ j., chlorate of potash, ↄj.— ℥ j., nitrate of silver, gr. j.—iij. to ℥ j. These should be applied in a very limited amount, all that is desired being merely to apply a thin coating of the solution to the membrane. The selection in each case of the special remedy to be used, must necessarily depend somewhat on the tolerance and the effect, keeping in view the fact, that it is not well to apply any fluid to the nasal cavity, which causes pain or irritation.

The nasal cavity, however, is oftentimes so sensitive that any application gives rise to pain more or less intense in character. This should be corrected immediately. This pain may

be caused by an over-sensitive membrane, or by the irritating qualities of the solution used. As a rule, it can be relieved by throwing in immediately an alkaline solution such as has been recommended for cleansing purposes, and preferably the Dobell's solution. Occasionally the application of aqueous solutions gives rise to severe frontal or facial neuralgias. This is due generally to the solution, of too low a temperature, making its way to the frontal sinus or the antrum of Highmore. This is an accident liable to happen to the most careful operator, and cannot always be avoided by the exercise of even the greatest care. When the accident does occur, the pain should be brought under control as rapidly as possible by the use of anodyne and soothing applications. The readiest method of controlling it, is by throwing into the nostril a powder containing from one-sixth to one-fourth of a grain of morphine, combined with a small amount of subcarbonate of bismuth and carbonate of magnesia. In many cases the use of solutions of mineral astringents, or in fact solutions of astringents of any kind, are not well tolerated. In these cases there may be substituted the use of a powder with very excellent results. These may be applied by means of the powder-blower shown in Fig. 47, after the parts have been thoroughly cleansed. For this purpose there may be used one of the following:

℞. Acidi salicylici..... gr. x.
Bismuth subcarb.,
Tannin.....āā 3 i.
M.

℞. Arg. nitrat..... gr. ij.
Bismuth subnit. ..... 3 ij.
M.

℞. Zinci sulphat..... ℈ j.
Pulv. acacia,
Magnesiæ carb.....āā 3 ij.
M.

℞. Zinci chloridi..... gr. v.
Pulv. belladonna ..... gr. x.
Pulv. amyli ..... ʒ ss.
M.

By the above indicated plan of treatment, much can be accomplished in mild cases of the hypertrophic catarrh. If the disease is not one of long standing, and the neoplastic tissue is of comparatively recent origin, and has not had time to become thoroughly organized, complete resolution may be confidently anticipated, if the treatment is carried out efficiently and persisted in for a sufficient length of time.

In the more advanced cases of catarrh, however, in which the new tissue has become firmly organized, and in which the morbid process involves a large extent of the naso-pharyngeal membrane, and in which the nasal cavity is seriously encroached upon by the neoplastic tissue, the plan of treatment above indicated will fail to more than alleviate some of the prominent symptoms of the disease; and it is these cases which form the great bulk of the cases of nasal catarrh that present themselves for treatment.

When the plan of treatment by atomization was first introduced, great results were anticipated. The same may be said of the Weber douche. It is undoubtedly true that the application, by these devices, of aqueous solutions of astringents, resolvents, etc., will do very much to relieve an advanced nasal catarrh; but that it often cures the disease is extremely doubtful. As before stated, the excessive secretion which is so prominent a feature of the affection, has its source largely in this hypertrophied tissue, and any astringent applied to it undoubtedly limits or keeps in abeyance the discharge, but the tendency is to a return of the trouble soon after the treatment is abandoned.

The proper treatment, then, must be of a more radical character, and must involve the use of some means by which the hypertrophied membrane can be destroyed. Hence, the successful treatment of nasal catarrh depends on the recognition of the form of the disease with which we have to deal in each individual. It is not intended in the compass of this article to discuss all the measures which have been resorted to for the accomplishment of the destruction of this hypertrophic tissue, but simply to enumerate the more prominent ones, and briefly to discuss their advantages and disadvantages, with the especial methods by which they may be used.

In this connection there should be mentioned a plan, first suggested by Dr. Wagner of New York, by which the attempt

is made to get rid of this neoplastic tissue by producing absorption. This is accomplished by the introduction of sponge-tents, so shaped that they can be inserted between the convexity of the turbinated bones and the septum, when, on imbibing moisture from the parts, they swell up and exercise pressure on the hypertrophied mass, thereby inducing atrophy. They are intended, of course, to remain in situ for several hours. This procedure is to be repeated at intervals, for a considerable length of time. The nose is extremely intolerant of the presence of a foreign body, and the time during which the sponge-tent remains, is one of considerable discomfort to the patient, on account not only of the complete closure of the nostril which it involves, but also on account of the irritation and pain which it excites. It is also somewhat difficult to so locate the sponge, that it will exercise an equable pressure on more than the convexity of the turbinated bone, whereas the hypertrophic tissue grows downward toward the flow of the nares as well as inward. It is questionable, therefore, whether this plan of treatment affords more than temporary relief.

Another method, recommended I believe also by Dr. Wagner, is that of passing metal bougies through the nasal cavity, thus dilating it after the plan of treating urethral strictures, in those cases in which the hypertrophy of the membrane has produced a stenosis of the passage. This is open to the same objection that was made to the use of sponge-tents; it gives but temporary relief. We know that the passage of any small probe through a "stopped up" nose will open it up for the time to the passage of air, and give decided relief to the discomfort of the patient. This relief, however, is but temporary, and it is extremely doubtful if any permanent good is accomplished.

Resource must then be had in the use of some destructive agent to remove the offending tissue. Those which we will enumerate, and briefly discuss are, the forceps, nitric acid, chromic acid, nitrate of silver, acetic acid, the actual cautery, and the galvano-cautery.

The forceps.—This instrument consists of a long-bladed stout pair of forceps, with a firm bite, and a row of teeth in the side of the blade. It is so fashioned that it can be introduced well into the nasal cavity, and the offending tissue being seized, is torn and wrenched out by brute force. Fig. 93 shows the forceps devised by Dr. B. Robinson for this pur-

pose. The operation is an extremely painful one; is attended oftentimes with a considerable degree of hemorrhage; it is done necessarily in a somewhat hap-hazard way, as the flow of blood obscures the parts after the first manipulation; and it is difficult to avoid tearing away more of the tissues than is desirable—healthy membrane, periosteum, and even portions of the turbinated bone being liable to be torn out.. We have

Fig. 93.—Robinson's forceps for removing hypertrophied tissue from the nose.

too many simpler, less painful, and more efficient methods to warrant us in subjecting the nasal cavity to such rough usage.

Nitric acid.—This is an extremely powerful destructive agent, but one great objection attending its use, lies in the difficulty of nicely localizing its action, and preventing its spreading to the healthy tissues. This difficulty has in a measure been overcome by an ingenious little device of Dr. A. H. Smith,

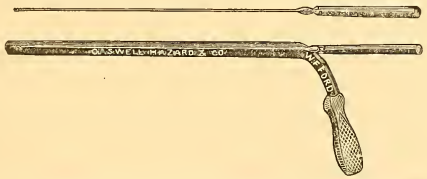

Fig. 94.—Smith's canula for applying caustics to the turbinated bones.

of New York, shown in Fig. 94. This consists of a small flattened tube of glass or hard rubber, in the distal extremity of which there is cut a small oval fenestrum. The tube is passed into the nasal cavity, and so placed that the membrane which it is designed to cauterize, pouches into the fenestrum. A probe wrapped with cotton is then dipped into the acid, and passed into the tube, until it reaches the opening. In this manner the cauterization is confined to the membrane lying against the opening of the tube. This procedure may be re-

peated until all the offending tissue is destroyed. Using some such device as this, nitric acid is an extremely valuable agent in the treatment of these advanced cases of nasal catarrh, and excellent results may be obtained by its use. It is mainly valuable for application to the hypertrophied membrane over the turbinated bones, being applied through the nostrils. It is not a safe caustic for application to the vault of the pharynx, as there would be danger of its dropping down the pharyngeal wall, and making its way into the larynx, which might be an extremely serious mishap. The main objection to the nitric acid lies in its great activity as an escharotic, by which more tissue may be destroyed than is desirable, or a too deep eschar may be formed which may result in a troublesome ulceration.

Chromic acid.—This is highly recommended by many, both for application to the turbinated bones and to the vault of the pharynx. It is a powerful escharotic and its use is comparatively painless. It possesses, also, in its acicular crystals, the advantage of a very convenient form for making the application. These can be easily taken up on a small probe, wrapped with a fine film of cotton, and carried directly to the part it is desired to destroy. The method of cauterizing the turbinated bones is sufficiently obvious. In reaching the glandular tissues at the pharyngeal vault, a properly curved probe is necessary, by the aid of which the acid may be carried directly to the part. By the use of a little deftness of manipulation, this procedure can be accomplished without tying back the palate, although it is better to do this, if the throat is very irritable and there is danger of injuring the healthy parts. It is best, as a rule, to use but a very few of the small crystals for each application. Occasionally it may seem well to use a saturated aqueous solution of the acid, but the crystals are more easily manipulated, and there is less danger with them of the cauterization extending farther than is desirable.

Nitrate of silver.—Probably no caustic has been used and abused to the same extent that nitrate of silver has. In mild solutions I regard it as one of the most valuable of all astringents. In the form of the solid stick, or strong solutions, I am disposed to think it has been responsible for more mischief than benefit in catarrhal diseases. It is a mistake to regard it purely as an escharotic, it is also a powerful stimulant, and

herein probably lies its efficacy in certain forms of ulceration. When applied to the hypertrophic membrane in chronic nasal catarrh, whether to the turbinated bones or to the vault of the pharynx, it undoubtedly destroys the superficial layer of the membrane, causing an eschar which is soon thrown off; by its stimulating properties, however, it sets in play certain structural changes in the deep layers of the membrane, which are liable to more than counterbalance the good that has been accomplished by the superficial destruction.

I formerly resorted quite frequently to the use of this caustic in hypertrophic catarrh, being led thereto possibly by its facility of application, but have almost invariably been disappointed of any permanent good results, and in many cases have undoubtedly done harm. The subjective symptoms resulting from its use also, it may be stated, are of a somewhat unpleasant character, as its immediate effect is to cause considerable pain and swelling of the parts.

It may, however, occasionally seem well to make use of this remedy in some of the milder, and somewhat localized hypertrophies. In these cases it should be added, that it is not well to use the ordinary caustic-holder in making the application to any portion of the air-passages, but the caustic should be fused on a properly fashioned probe. We are usually taught that a platinum or aluminium probe is necessary, but an ordinary brass or copper wire answers an excellent purpose. This may be flattened and bent in the proper shape, and then, by taking a few crystals of the caustic upon it and holding it over a gas-jet or spirit-lamp, the crystals are melted into a small bead, which adheres closely to the probe, and can be carried safely to the part it is designed to cauterize without incurring the danger of their falling off.

Acetic acid.—The well-known affinity of this agent for epithelial cells, and its action on the localized hypertrophies of the superficial layers of the integument, would suggest its use in those hypertrophic thickenings of the mucous membrane in which the epithelial layer plays a prominent part. This is the case in the changes which occur in the lining of the nasal cavity proper, in the form of catarrh under consideration. In this agent, then, I think we have a method of destroying this thickened tissue which possesses most of the advantages and few of the disadvantages which attend the use of any of those

already alluded to. It is not well adapted for use in the vault of the pharynx, but for application to the nasal cavity proper it is a most excellent remedy. It is efficient in destroying tissue, it is easy of application, it causes no secondary inflammation, it does not cause too much destruction of tissue, and thereby the danger of subsequent troublesome ulceration, and it is easily tolerated.

The manner in which it may be applied is as follows: a self-retaining speculum being introduced, a flattened probe, bent at an angle of 150° (Fig. 95), is wrapped with a small pellet of cotton and dipped in the acid, and passed rapidly through the cavity between the lower turbinated bone and the septum, to be repeated with the middle and upper bones if they are affected. The application is somewhat painful, of course, but the pain can be instantly relieved by throwing in by the atomizer, a solution of common salt, ʒss.—ℨj., sodæ bicarbonat.,

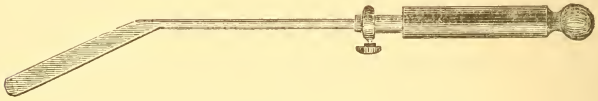

Fig. 95.—Probe for applying acetic acid to the turbinated bones.

ʒss.—ℨj., or better still, Dobell's solution (Appendix, Prescription No. 1). The first effect of the application is to cause considerable swelling of the parts, with closure of the passage. This lasts a few hours, or perhaps a day, when there commences to be discharged shreds of whitish membrane, the exfoliation of the cauterized membrane. This discharge may continue for several days, and will result in not only a more patulous condition of the cavity, but also a marked diminution of the excessive secretion.

I have rarely been disappointed of most excellent results by the aid of this remedy, and confidently recommend its use. It not only destroys the surface layer of the hypertrophied tissue, but seems to control and check the morbid activity in the deeper layers of the membrane. If too much irritation is caused by the application, made as suggested above, the amount of acid placed on the probe can be limited by taking the acid upon another small probe, and dropping it on the probe to be used. In this manner the flattened probe can be charged on

one or the other side, according to the side of the nose to be treated. In this manner also the septum remains untouched by the acid.

Actual cautery.—I at one time made considerable trial of stout wires, fashioned into different shapes and heated to a red heat, for destroying the thickened tissue over the turbinated bones anteriorly. The applications were extremely painful; the wires being necessarily small, the heat was rapidly dissipated, and hence the amount of destruction accomplished was limited; and moreover, from the use of so sluggish a heat, probably, the applications seemed to set up too much irritation. This method of cauterization cannot be recommended as possessing any advantages over others, but rather should be condemned.

The galvano-cautery.—This instrument is coming into more general use every year, and deservedly so, as it possesses many and decided advantages over any of the devices alluded to for the destruction of the hypertrophic tissue in nasal catarrh. It is rapid in its action, its use is not attended with any marked degree of pain, it is efficient in destroying the tissue which it is desired to remove, and it is in no great degree stimulating, although, of course, it causes a considerable degree of subsequent irritation and swelling of the parts. This soon subsides, however, and with it all tendency toward the development of any renewed inflammatory action in the deeper tissues of the membrane.

In Fig. 96 is shown a set of instruments which I have had constructed for my own use to fulfil the requirements of a light, easily manipulated handle, and an electrode mounted at such an angle as will still further facilitate the ease of manipulation, and also mounted in such a way as will enable the operator to follow by ocular inspection the movements of the heated wire. As will be seen, the circuit-closer is immediately under the thumb when the instrument is held in the hand, and the current can be closed or opened at will. Mounted in the handle in the cut is shown a slender electrode fitted with a flat blade, and designed for cauterizing the face of the turbinated bones.

Occasionally I use the knife (Fig. 96, *a*) when the hypertrophied mass anteriorly stands out prominently, making a linear incision along its face, and cutting deeply. The effect of

this is to produce an incision which, in closing, forms a long cicatrix, which contracts to a greater extent than results from a superficial cauterization. As will be noticed, the cutting blade occupies but one side of the electrode.

For making applications to the vault of the pharynx, the difficulty generally met with is in managing the soft palate, which lifts itself up, and is in danger of being burned by contact with the electrode. This may be obviated by tying the palate after the manner of Wales. (See page 29.) This, how-

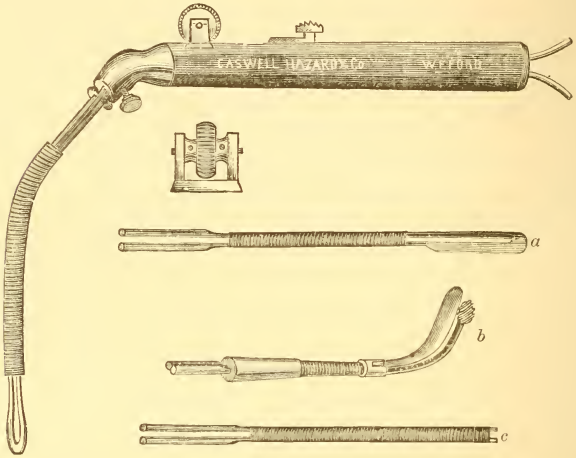

FIG. 96.—The author's galvano-cautery instruments. The electrode for making application to the turbinated bones is mounted in the handle; *a*, knife for making linear incisions on the face of the turbinated bones; *b*, electrode for the vault of the pharynx; *c*, ecraseur.

ever, consumes time, and is not always agreeable to the patient. I have devised the electrode shown in Fig. 96, *b*, for making this application, without the necessity of tying the palate. As will be seen, it consists of a spiral wire, mounted at the proper curve for reaching the pharyngeal vault; over this there is fitted a hard-rubber hood. When the instrument is passed to the point at which it is desired to cauterize, it is pressed against the part, and emerges from its hood, when the circuit may be closed and the part burned. Before removing it the circuit is broken, when it is easily withdrawn. The pal-

ate, during the manipulation, is perfectly protected and saved from any injury.

There is shown also in the plate (Fig. 96, *c*) a slender double canula for use with the ecraseur. The wheel ecraseur is shown, not only mounted on the handle, but also separately and in front outline. It is so constructed that it can be joined to or detached from the handle with perfect facility. This is the device of Dr. Shurley, of Detroit, so modified that the wheel can be turned by the thumb.

Fig. 97 shows a very ingenious device of Dr. Lincoln's, of New York, for accomplishing the same end. In this instrument the whole electrode is within a spiral spring, in the end of which there is mounted a cup-shaped hard-rubber hood, within

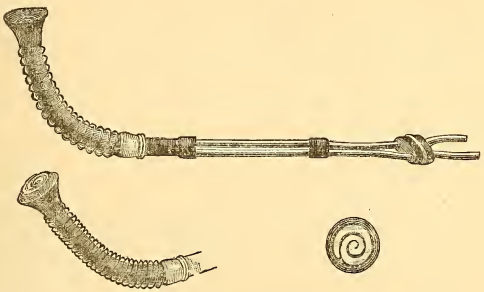

Fig. 97.—Lincoln's electrode for the vault of the pharynx.

which lies the platinum cone. Passing the instrument to the vault of the pharynx, and pressing the cup upon the parts, the cone emerges from its retreat, and again falls into it on the release of the pressure.

The practical working of this instrument is not entirely satisfactory in all cases, as the play of the cone in its cup is liable to be hampered more or less; and, moreover, its direction is upward, and while reaching the upper portion of the glandular mass in the vault, it fails to reach that larger portion of the mass which lies on a more vertical plane.

In using the cautery through the anterior nares, especially if the septum is not involved, and it is only desired to cauterize the turbinated bones, the speculum of Dr. Shurley (Fig. 98) should be used. This instrument has fitted into its inner

blade a movable ivory slide, which can be passed into the cavity and along the septum, thus completely protecting it from the impact of the heated electrode. Of course a different instrument is necessary for each nostril.

The serious objection to the galvano-cautery lies in its high cost, but the excellent results that may be obtained from its use should induce every physician who is called on to treat many cases of nasal catarrh to have it in his power to use it. As regards the battery to be preferred it is difficult to decide. The Dawson battery is, perhaps, the most simple in its action, and fully as reliable as any. The Piffard and Byrne batteries are also most excellent instruments.

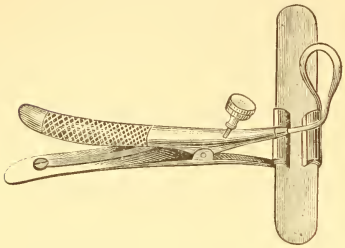

FIG. 98.—Shurley's nasal speculum with movable slide.

By following out the above-described plan of treatment, it will be found that most cases of hypertrophic catarrh, of even very long standing, will be overcome. In some cases, however, there is met with a condition which, as a rule, will require a still different method of treatment. This condition consists in an excessive hypertrophy of the membrane covering the posterior termination of the inferior turbinated bone, resulting in a large rounded mass, almost, if not entirely, filling the oval opening of the posterior nares. An excellent example of this is shown in Fig. 99. Why this excessive growth of the morbid tissue should develop at this place, can only be accounted for by the fact that this is the widest part of the nasal passage, and hence there is less hindrance to the hypertrophic process. The rhinoscopic examination (see Fig. 99) easily reveals the ex-

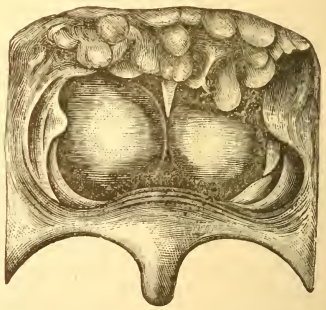

FIG. 99.—Hypertrophy of the mucous membrane of the inferior turbinated bones posteriorly, from a drawing of a case reported by Dr. Lefferts. (From Robinson.)

istence of this condition. There will be seen the rounded mass, more or less completely filling one or both posterior nares, and showing the characteristic grayish-white blanched color, wrinkled surface, and seamed or slightly fissured outline of hypertrophic tissue. Springing from the end of the turbinated bone it grows outward, downward, and backward, forming a sessile tumor projecting toward the septum internally, resting on the floor of the nares and soft palate below, and protruding somewhat into the upper pharynx posteriorly. Owing to its position and shape, it is not feasible to destroy the mass by cauterization, or by any of the measures already alluded to. By far the most satisfactory method of dealing with it is to remove it by a small ecraseur or snare. This was first done, as far as I know, by Dr. Jarvis of this city, who has devised a very ingenious and efficient little instrument for the purpose. This is shown in Fig. 100. It consists of a slender but stout tube, about the size of a No. 3 sound, English scale, on the proximal end of which there is turned a fine thread about two and a half inches long. On this thread there plays a round milled nut, which carries before it an outer tube two and a half inches long, which slides over the threaded portion. The end of the outer tube is fitted with two small pins. The wire used may be fine annealed wire, or, better still, piano wire. The working is obvious ; the two ends of the wire are passed up through the canula and fastened to the pins on the proximal end of the outer movable tube, leaving a loop at the distal end. By turning, now, the milled nut the outer tube is carried up and at the same time draws in and contracts the loop.

Fig. 100.—Jarvis' wire snare ecraseur.

The action of this little instrument in removing these masses leaves nothing to be desired. It should be fitted preferably with No. 5 piano wire, as possessing more elasticity and tensile strength than the annealed wire. Owing to its small size, this instrument can be passed through a nasal cavity even if it be very greatly encroached upon by the hypertrophied membrane of chronic catarrh. In operating,

the snare is prepared with a loop which, on inspection of the mass, it is judged will pass over it; then, first, bending the loop slightly outward, it is passed through the cavity until it has reached the end of the turbinated bone, when the bend given to the loop will throw it over the mass (See Fig. 101). Exercising now a slight traction on the instrument, if it is found to be engaged, a few turns of the milled nut will secure it, after which the mass may be cut through at leisure. It is best that the operation be done very slowly, consuming even a half-hour or an hour after the loop is in place, as by this plan it can be accomplished with but slight hemorrhage. If there is any difficulty in placing the loop in position, the rhinoscopic mirror should be used to reveal its position and the obstacles to its proper adjustment; these latter can, of course,

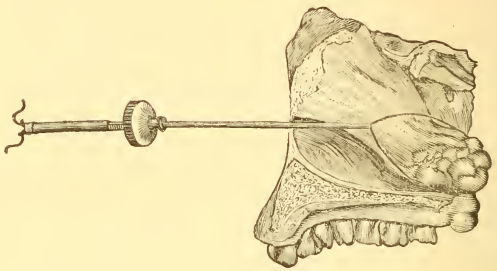

Fig. 101.—Hypertrophy of the lower turbinated bone posteriorly, with Jarvis's snare in position for removing it, from a pathological specimen in the possession of Dr. Jarvis.

be easily overcome by throwing the wire over the mass with the finger passed around the palate. I have repeatedly seen masses removed by this instrument quite as large as chestnuts, the relief given being very marked.

Occasionally there will be found a prominent mass of hypertrophic tissue at the anterior termination of the lower turbinated bone. This may be so great as to more or less completely occlude the anterior nares, and, of course, give rise to no little discomfort to the patient by the interference with breathing. A simple device of Dr. Jarvis enables one to remove this also with the ecraseur. The mass is transfixed by a long slender needle, mounted in a light handle, and the loop is passed over the needle, and made to engage the portion of the mass which has been transfixed, when it is slowly cut through. I have

frequently made use of this simple device with most satisfactory results, relieving, oftentimes immediately, a very annoying anterior stenosis which had caused no little obstruction. The cicatricial contraction which ensues also seems to still more relieve the stenosis.

In those cases in which the vault of the pharynx is involved, and this region will be found to be diseased in a very large proportion of cases of nasal catarrh, the plan of procedure will depend mainly on the character and extent of the morbid condition. If there be an excessive hypertrophy of the glands, as manifested by the large, rounded, and oftentimes pendulous masses developed in this region, active surgical measures will be required. These measures will consist in the use of the galvano-cautery, the forceps, or the curette. My preference is very decidedly in favor of the galvano-cautery ; I have used it in a number of cases and with excellent results. The method

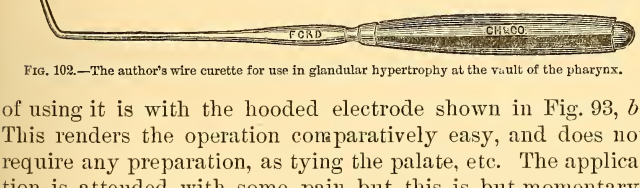

FIG. 102.—The author's wire curette for use in glandular hypertrophy at the vault of the pharynx.

of using it is with the hooded electrode shown in Fig. 93, *b*. This renders the operation comparatively easy, and does not require any preparation, as tying the palate, etc. The application is attended with some pain, but this is but momentary and can be relieved immediately by throwing upon the parts some alkaline solution, as Dobell's Solution, Prescription No. 1, in the Appendix.

The use of the forceps consists in the seizure, and evulsion of the masses, by means of a stout pair of curved forceps. I have never used this instrument, but should consider it a somewhat harsh procedure.

Occasionally there will be found a condition at the vault of the pharynx, in which the hypertrophy seems to spread broadly over the whole region, and to be composed of small rounded masses, which do not project to any great extent from their bed. In these cases I have occasionally resorted to the use of the wire curette shown in Fig. 102. This instrument is Thomas'

soft copper wire uterine curette, bent in such a manner as to adapt it for use in the pharyngeal vault. Its use is not especially painful, and it serves an excellent purpose in breaking up and disorganizing these growths.

In Fig. 103 is shown a somewhat more elaborate curette, devised by Mackenzie, in which the loop can be fixed at any desired angle. The loop also possesses a cutting edge, in place of the scraping edge of the curette I have been accustomed to use.

In case the hypertrophy has not developed to any marked extent, the use of chemical agents will be resorted to in preference to surgical measures.

As already suggested, chromic acid seems to afford the best results. Its fine acicular crystals also afford an excellent form for convenience of application. Nitrate of silver I have occasionally employed, but I know of no good reason for its use.

FIG. 103.—Mackenzie's curette.—"At *a* there is a button by means of which a small rod acting through a spiral spring bolts the hinge at *b*, and thus fixes the cutting loop *c* at the desired angle." (Mackenzie.)

Nitric acid should not, as a rule, be applied in the vault, as it is difficult to limit its action, and there is a possible danger of its reaching parts which it is not desirable to touch.

As regards the use of sprays and douches in this region, it is impossible to produce absorption of this hypertrophied tissue by any means other than destructive agents; and all that can be hoped for by these methods will be the alleviation of symptoms. This can undoubtedly be accomplished by the spray and douche, and that in a marked degree very often, but the relief is only temporary.

To sum up, then, somewhat briefly, in regard to this question of catarrh, we may accept the following conclusions. The essential morbid condition in chronic nasal catarrh of long standing, consists in a hypertrophy of the mucous membrane lining the nasal cavity proper, and the vault of the pharynx; and the

successful treatment of the affection lies in the destruction of this thickened tissue. Of the resources at present available, the galvano-cautery affords the best results, and is equally applicable to the nasal cavity proper, and also to the vault of the pharynx. In those cases which present extensive enlargements at the posterior termination of the inferior turbinated bone, the galvano-cautery is not available. In these cases the mass should be removed, and the best method of doing this is by means of Jarvis' snare (Fig. 100). The galvano-cautery being an expensive and cumbrous instrument, and not always at hand, the use of some one of the chemical agents will become necessary. Of these, for use in the nasal cavity proper, being applied through the nostrils, I should give preference to acetic acid, after this to chromic acid, and last to nitric acid. The acetic and nitric acids are neither very applicable to the vault of the pharynx; hence, of the chemical agents for treating this region, I should give preference to the chromic acid. Nitrate of silver should not be used, as it is in the end more powerfully stimulant than destructive. The actual cautery is not well borne and not very efficient. The use of the forceps for tearing away tissue is an unnecessarily harsh procedure. Sponge-tents and steel sounds do not accomplish the desired end.

In making use of destructive agents in the nasal cavity, it is not well to prolong the sittings, or to attempt to do too much at one session, nor is it well, as a rule, to repeat the operations oftener than once in a week, or, better still, once in two weeks. At the time of operation it should be the constant aim of the operator to accomplish the treatment with as little irritation as possible, and this is measured by the amount of pain given.

The application of the cautery or caustic should be followed as quickly as possible by the application to the burned surface of some mild alkaline solution in the form of spray, or by the syringe. For this purpose there may be used a solution of salt, soda, lime-water, or any bland unirritating fluid. Dobell's solution answers the purpose excellently well. If these fail to relieve the pain, sweet oil or vaseline may be used. Watery solutions should, however, be given the preference, as they serve to cool the parts and reduce the heat, thereby lessening the danger of subsequent mishap.

The accident most liable to occur after cauterization of the nasal cavity is facial erysipelas. When we remember that this

may occasionally develop from an attack of acute coryza, it is easy to understand why it is liable to occur after the use of caustics or the cautery in the nose. In my own experience it has occurred once as the result of the use of nitrate of silver, and in another instance from the use of the galvano-cautery. It should be borne in mind, therefore, as one of the accidents that may occur. As regards the method of preventing its occurrence, I know of nothing better than the free use of alkaline solutions, as above, and the avoidance of too frequent and too prolonged sittings.

It should not be understood that the plan of treatment detailed above for the management of the advanced cases of hypertrophic catarrh, does away entirely with the use of the douche and spray; on the contrary these methods are unquestionably of great value and should always be resorted to in connection with the destructive agents. While portions of the lining membrane of the nasal cavities are involved in the hypertrophic process, other portions are in a condition of simple catarrhal inflammation, and hence require the application of astringent remedies. These, therefore, should be resorted to under the rules given in the earlier portion of the section.

Before closing this branch of the subject it may be well to refer to a feature of nasal catarrh, not infrequently made use of by irregular practitioners. There are certain remedies whose action on the mucous membrane of the nose is powerfully stimulant, and the result of their use is to produce a condition not unlike a cold in the head, of a most aggravated and distressing character. The membrane is irritated and painful, the secretions are stimulated to an extremely abnormal extent, and are poured out in the greatest excess; there is headache, facial neuralgia, etc. This may last a number of days, and, as a rule, they are days of great suffering.

Now, when these symptoms subside, there ensues a period of almost entire freedom from all the prominent subjective symptoms of catarrh. What has happened is probably as follows: under the influence of the stimulating application all the normal functions and processes of the membrane take on an excessive activity; the blood-vessels are greatly distended, and the secretion of mucus is enormously increased, especially in its watery constituents. This discharge pouring

through the tissues, clears them out, all the conduits of the membrane are flushed, as it were, hence there is carried off a great quantity of worn-out epithelium from the surface of the membrane and from the cavities of the glands. The cells, also, which have infiltrated the deep layer of the membrane, are swept out. The result of it all is that when this activity subsides, the membrane is left in a comparatively healthy condition as regards functional activity. This condition of comparative health may last for weeks; but sooner or later all the old trouble returns in as aggravated a form as before, and probably in a worse one. This plan of treatment is not a rational one, and results in no permanent benefit to the patient; and yet it is the one on which is based an immense number of so-called cures of catarrh.

CHAPTER XIII.

CHRONIC NASAL CATARRH (Continued).

Atrophic or Dry Catarrh.

This form of catarrh is one in which, as the result of chronic inflammation, the glandular structures of the membrane are destroyed or their function so far interfered with that the membrane fails of the normal supply of mucus by which it is kept in a soft, moist, and pliable condition. It will be remembered that in the chapter on mucous membranes it was stated that the prominent feature of chronic inflammation, is a deposition in the deep layer of the structure, of newly developed connective and elastic tissue, and other of its normal constituents. As a result of this, the glands and follicles become so crowded and pressed upon, that they undergo atrophy, or their function becomes greatly interfered with. This may occur very early in the course of a chronic inflammation, as the result of simple mechanical interference with function, by pressure on the glands, by the crowding of the new elements; or it may occur in the later stages, by the contraction which takes place in the connective tissue as it becomes more firmly organized, encroaching upon and destroying the glands. Hence this form of the disease may occur comparatively early in the progress of a chronic nasal catarrh; or it may be a very late development, in which case it becomes a sequela of the hypertrophic form of the disease. Its course is very much influenced by the surroundings of the patient, the atmosphere which he breathes, his occupation and habits of life. Persons living in an abnormally dry atmosphere, in which the upper air-passages rapidly lose their moisture, are liable to develop the dry form of catarrh quite early. As a matter of clinical observation, tailors, shoemakers, tobacco-workers, laborers in spice-mills, house-carpenters, etc., are extremely liable to dry catarrh. It may be stated,

as a rule, that indoor workers are far more liable to this form of the disease than those whose occupation is in the open air. Especially is this true of those who work in crowded and badly ventilated rooms. Attacks of dry catarrh are very liable to occur in those suffering from nasal catarrh, from temporary causes, such as an evening spent in a dusty and crowded concert or ball-room, or under any circumstances which involve the necessity of breathing an abnormally dry atmosphere.

Those causes which tend to produce this affection during the day, are far more active during sleeping hours; and a single night spent in an abnormally dry atmosphere may prove sufficient to give rise to a dry catarrh, which, though temporary in character, occasions no little pain and annoyance.

Symptoms.—The prominent symptoms of the disease are more or less marked pain of a somewhat sharp and tingling character, with an excessive irritability of the parts. This pain is probably due to pressure on the terminal filaments of the sensory nerves. If the anterior nares are affected, the sense of smell is somewhat impaired. There is pain extending to the forehead, and the disease is marked by the accumulation in the nasal cavity of thin, dry, closely adherent crusts. These are very tenacious and are detached with difficulty. They have a grayish color, and consist mainly of mucus and muco-pus, discolored by such impurities as the inspired air may lodge upon them. In the earlier stages of the disease in this locality, the symptoms are not very prominent. There is a sense of discomfort, with slight tingling in the nose, and a condition of irritability under the influence of changes of temperature of the inspired air; a breath of cold air drawn through the passages, as a rule, being quite painful. There is a moderate increase of secretion, which is removed with difficulty on account of its tendency to dry upon and adhere to the parts. As the disease progresses, the symptoms become more marked; the thin pellicle of dried mucus which characterized the earlier condition, now becomes a thick crust, which adheres with still greater tenacity. The amount of discharge is considerable, and yet it loses its moisture very rapidly, and even when first secreted is poured out as a thick, viscid fluid. As these masses accumulate in the nose, there is a tendency to decomposition, which gives rise to a peculiar and slightly

offensive odor; it is not fetid in character, but has more of a musty odor. As the result of the irritation of these crusts, superficial erosions may take place on the mucous membrane, which bleed easily to the touch, and under the irritation of the mass lying upon them and irritating them, so that there are occasionally found small masses of blood in the discharges.

If the vault of the pharynx is involved, the secretion from this part becomes of the same dry tenacious character. These masses form in the dome of the pharynx and extend down behind the soft palate, between it and the wall of the pharynx; they adhere closely to the parts, and are removed with difficulty, it being often necessary to seize them and tear them off with the forceps. They give rise to a feeling of exceeding discomfort in the fauces; there is a sense of a foreign body which the sufferer attempts to dislodge by ineffectual efforts at swallowing, and the act itself becomes difficult and painful from the lack of proper flexibility in the faucial mucous membrane. There is a feeling of dryness in the throat, with pain of a sharp, stinging character.

Examination.—On examination of the lower pharynx there will be seen a peculiar, dry, parchment-like appearance of the membrane, with a plug of dry shreddy mucus protruding in the median line. The mass is generally discolored by the impurities of the inspired air. If now a mirror is placed in position to bring into view the upper portion of the pharynx, the same condition will be seen. The membrane presents a dry and glazed appearance, and is covered by a thick, dirty crust of inspissated mucus, which seems to pile itself in the median line, sending out rootlets, as it were, into the crevices and fissures between the enlarged glandular masses which lie beneath. If this mucous plug is removed and the membrane thoroughly moistened, these appearances entirely disappear, and there is left behind a mucous membrane, much reddened, as the result of the measures resorted to for cleaning, but entirely healthy in appearance, unless the disease has resulted from the hypertrophic form of catarrh, when there will be found in this locality the hypertrophied glandular tissues which characterizes that form of the disease. The examination of the posterior nares shows, ordinarily, very little that is characteristic of this affection, except in very advanced cases there may be brought into view a few of the dry crusts or masses in the

upper portion of the cavity, in the region of the middle or upper turbinated bones.

As a rule, however, our information in regard to dry catarrh is derived from inspection of the anterior nares and vault of the pharynx. The examination of the anterior nares shows in one or both cavities, and generally in both, the same abnormal dryness of the mucous membrane with the accumulation upon it of thin crusts of inspissated mucus or mucopus, varying with the age and duration of the disease. These crusts mainly form in the upper and anterior portion of the cavity, on the faces and anterior terminations of the middle and lower turbinated bones, and also on a portion of the septum. If these parts be thoroughly cleansed, the same is true here also that was true with regard to the vault of the pharynx, that the mucous membrane will be found to present a fairly healthy appearance, except that it is much congested and reddened as the result of the irritation caused by the means used to remove the accretions, except in those cases in which the disease has supervened upon the hypertrophic form of catarrh, in which case the appearance will remain of that condition.

Treatment.—The first and most important feature of the treatment will be the thorough removal of these crusts and masses of dried mucus. The accomplishment of this purpose requires somewhat vigorous measures. It is needless to say that the ordinary nasal douche is inadequate for the purpose, in that the fluid fails to reach the upper portion of the cavity, and also that its current is entirely too slow and sluggish to detach the masses. The best means we have at our disposal is the post-nasal syringe shown in Fig. 54. This may be inserted behind the palate, or into the anterior nares through the nostril, from which points the fluid may be thrown with sufficient force to thoroughly detach and loosen the accumulations, and accomplish the desired end of cleansing the membrane, and preparing it for the subsequent treatment. Occasionally these masses adhere so tenaciously that they cannot be removed by means of the syringe. Resort may then be had to the use of a slightly curved probe wrapped with a pellet of cotton, which may be passed through the middle meatus back to the pharynx and drawn out through the lower meatus, thus sweeping through the nares and loosening the masses not removed by the syringe. If this is not sufficient it will be necessary to use a pair of slender forceps

for seizing the masses and extracting them. The success of these procedures should be made evident by repeated inspection of the parts, and when the examination reveals that the membrane is thoroughly cleansed it is ready for the next step, which is the application of such remedies as will tend to restore its normal secreting function. For this purpose there are used various agents which are designated as stimulating applications. These are, in the order of preference, sanguinaria, galanga, carbolic acid, creosote, salicylic acid, iodine, bromide of potash, belladonna, myrrh, etc. The efficacy of these remedies lies probably in their irritating qualities. Being applied to a membrane, they give rise to a local irritation of the parts, which in turn leads to a stimulation of the glandular structures, by which a discharge of mucus is excited, and which is poured out with more or less profusion.

The remedies above alluded to may be used either in the form of powder, by insufflation, or in solution by means of the atomizer. The best results can be secured, however, in dry catarrh by the use of powders; as by this means there is obtained a more permanent and longer continued action of the drug than by solutions, which are washed away more rapidly. Sanguinaria is placed first in the remedies above suggested, as of this drug I can speak more confidently than of the others, having made a larger use of it, and with excellent results. It is powerful in its action, and occasionally gives rise to a considerable degree of pain of a burning, smarting character; hence its use should be undertaken with some little care.

The pure drug should not be used, but it should be somewhat reduced, as follows:

℞. Pulv. sanguinariæ,
Pulv. myrrhæ.....āā ʒ j.
Lycopodii..... ʒ ij.
M.

The amount of the sanguinaria in the above may be increased or reduced according to the result of its use. Of the galanga I have made use only to a limited extent, and cannot speak so confidently of its action. In many cases, however, it has seemed to act even more favorably than the sanguinaria.

The galanga may be used pure, or reduced by the addition of any of the neutral powders as,

℞. Pulv. galangæ,
Pulv. amyli.....āā ʒj.
M.

℞. Pulv. galangæ,
Pulv. myrrhæ,
Pulv. acaciæ.....āā ʒj.
M.

The above method may not always be well borne, in which case resort may be had to one of the following:

℞. Acidi salicylic..... ℈j.
Lycopodii.....ad. ℥ss.
M.

℞. Potass. bromidi..... ʒj.
Sacch. alb..... ʒiij.
M.

℞. Pulv. myrrhæ,
Lycopodii.....āā ʒj.
M.

℞. Pulv. belladonnæ..... ʒss.
Magnesia calc..... ℥ss.
M.

℞. Sodæ salicylat..... ʒss.
Sodæ bicarb..... ℈j.
Pulv. amyli..... ℥ss.
M.

In using solutions, the same drugs may be used, and of much the same strength, or there may be used,

℞. Acidi carbolici..... gr. x.—xxx.
Aquæ..... ℥j.
M.

℞. Creosoti..... ♏ x.—xxx.
Aquæ..... ℥ j.
M.

℞. Tr. iodini co..... ʒ ss.
Aquæ..... ℥ j.
M.

℞. Potass. bromidi..... ʒ ss.—ʒ ij.
Aquæ..... ℥ j.
M.

In using the powders they should be thrown behind the palate by means of the powder insufflator shown in Fig. 47; and also, if the anterior nares are affected, through the nostrils. In using solutions the atomizer should be employed as throwing in but a very moderate amount of the fluid and at the same time accomplishing its thorough distribution.

At the commencement of the treatment, especially if the case be an aggravated one, it will be necessary that the patient be seen every day; as improvement is noticed, however, less frequent applications will be sufficient.

It is well, generally, that the patient should aid the efforts of the physician by carrying out certain simple measures at his own home. This consists in keeping the diseased membrane, as far as possible, moistened, by the use of some mild alkaline solution, to which there may be added carbolic acid or salicylic acid. This can be thrown in by the small atomizer, Fig. 63, or Richardson's atomizer, Fig. 61, and repeated two or three times daily, if necessary. For this purpose there may be used one of the following:

℞. Acidi carbolici..... gr. v.
Sodæ biborat..... ʒ j.
Aquæ..... ℥ j.
M.

℞. Acidi salicylici..... gr. vj.
Sodæ bicarb..... ʒ ss.
Aquæ..... ℥ j.
M.

By this means the membrane is kept moistened, and the tendency to incrustation to an extent is controlled. In addition, certain general directions should be given to the patient, as to the avoidance of those conditions which have a tendency to aggravate his trouble, such as attention to the atmosphere which he habitually breathes. If his occupation compels his confinement to a close room and a dry atmosphere, some artificial means should be provided for charging the air with moisture. As has been said, there are certain occupations which favor this form of catarrh, which in general may be described as those in which the atmosphere is either excessively dry, or filled with fine particles of dust, such as working in tobacco, at artificial flowers, indoor carpentery, etc. The avoidance of these deleterious influences may be secured by proper ventilation of working rooms.

Fetid Nasal Catarrh.

In the atrophic or dry form of catarrh previously described, fetor does not usually occur, but its tendency is toward the development of a form of disease in which the discharge of fetid and offensive masses is the prominent symptom. As the result of the destruction of the glandular structures of the membrane, there is poured out on its surface a thick, viscid mucus which is deficient in its watery constituents. This mucus loses its moisture rapidly by evaporation, and there results a thin dry pellicle which adheres closely upon the membrane, forming virtually an air-tight shield, which covers the convexity of the turbinated bones, and also extends into the sinuosities of the cavities. This condition constituting dry catarrh may exist for a lengthened period, giving rise merely to the symptoms enumerated in the previous section. The long-continued action, however, of this condition, tends to develop a fetid catarrh in the following manner: A viscid mucus is secreted which, losing its moisture, forms a dry pellicle on the surface of the membrane; the parts beneath are protected from contact with the current of air by this air-tight shield, and hence the secretions which are still poured out are not only imprisoned, but also retain their moisture and remain fluid. In the earlier stages of the affection this adventitious pellicle does

not adhere very closely to the parts, but is removed by the ordinary effort of blowing the nose, and hence the secretions are retained but a brief period. As time elapses, however, and the disease assumes the more chronic form, this dried pellicle adheres quite closely to the membrane, and, resisting ordinary efforts to remove it, may remain in place for days or even weeks. This is especially true if the incrustation forms in the narrower portion of the cavity, and in the sinuosities beneath the turbinated bones. As the result, therefore, of the long retention of the secretions, they undergo degeneration, and certain putrid changes set in. The secretion from beneath going on, the pellicle is lifted from the surface of the mucous membrane, and there are formed thick incrustations or masses. As the result of the retained secretions undergoing degeneration, the mucous secretion gradually changes to a muco-purulent discharge, and finally there sets in a discharge which is mainly of a purulent character, and whose source is largely in the epithelial layer of the mucous membrane. This purulent discharge, I think, lying in contact with the membrane, serves to reinfect it to a degree, and still further aggravates the disease, by exciting a more profuse purulent discharge. We have thus an illustration of what usually occurs in inflammation of those mucous tracts whose walls lie in contact, as in the vagina, or the urethra. In acute catarrhal inflammation of these parts, the secretions, as a rule, become purulent in character very rapidly, this being due probably to the fact that, their walls being in contact, the discharges are to an extent imprisoned. In the nasal cavity, as long as the secretions have free exit, even if a catarrh has existed for years, we never meet with a purulent or fetid discharge, this only occurring from imprisoned secretions in the manner above indicated; in true ozæna to be described; and in ulceration from syphilis, etc.

As already noticed, the result of the establishment of a fetid catarrh is, that there are formed inspissated masses in the nasal cavity which are detached and voided with great difficulty. As the secretion goes on from the surface of the mucous membrane, the masses are lifted from their bed, and still losing their moisture, large crusts are gradually built up from below, which mould themselves to portions of the cavity, and at the same time wedge themselves in its narrower portions, in such a manner that the sufferer is unable to dislodge

them, and they may remain in position for days and even weeks. Their odor is offensive in the extreme, as the result of this long retention, during which time the putrefactive changes are constantly going on. They are voided in mass at intervals, but more frequently small portions become detached and are expelled in the act of blowing the nose, in connection with an amount of the purulent discharge which escapes from beneath them, mingled with the healthier mucus which is secreted from those portions of the mucous lining which are unaffected.

Another prominent feature of this form of nasal catarrh which is very noticeable consists in a shrinking up or atrophy of the turbinated bones. This may be present in advanced cases to such an extent that these bones may almost entirely disappear, giving rise to a condition of the nasal cavity in which its wide patency, or roominess, as it were, is very striking. This is accounted for as follows: At the commencement of the morbid process, in atrophic catarrh, there is formed on the mucous membrane a thin pellicle which, as the result of its loss of moisture, necessarily undergoes contraction. On a concave surface this contraction would exert no influence, but on a convex surface, as over the turbinated bones, the result would be a certain amount of pressure exercised upon the parts beneath. This action is not unlike that of a film of collodion painted over a part, which, as we know, contracts in a marked degree as the ether evaporates, and exerts a considerable amount of pressure even when the part is but slightly convex. The dry pellicle which forms on the convexities of the turbinated bones in the atrophic form of nasal catarrh is not unlike a film of dried collodion in appearance, and the analogy may be carried still further in the pressure which it exerts on the parts beneath, in its contraction. This action continuing through months and years, and finally resulting in atrophy of the bony tissue, is only another exemplification of what is so frequently brought to our notice in other morbid changes which occur in the economy, viz., that the long-continued action of an apparently very slight morbid condition may eventually result in structural changes in the system, which are surprising to us in that they are by no means commensurate with the oftentimes almost trivial exciting cause.

This form of catarrh is essentially a disease of the nasal cavity proper and does not extend to the vault of the pha-

rynx. If the explanation given in regard to its method of development is the true one, it will be readily understood that the pharyngeal vault could not well become involved in the same process; for while a dry catarrh may, and very frequently does, develop in that region as the result of structural changes within the tissues of the mucous membrane, a fetid catarrh, on the other hand, is a secondary process, and results from the action of influences which are mainly from without. And furthermore, in the pharyngeal vault there is not the same tendency to the accumulation and retention of secretions, nor would the dried pellicle of the atrophic catarrh exert any pressure on the concavity of this region, but would rather tend to become detached by its contraction.

Symptoms.—From what has been already stated, the prominent symptoms of the disease are made apparent. They consist mainly in the accumulation in the nasal cavity of these offensive masses and crusts, and their separation and discharge at intervals, together with more or less of a fluid discharge. The nasal cavity is not encroached upon, hence nasal respiration is not obstructed. The breath is extremely offensive, and yet the sufferer, as a rule, is not conscious of it. This is partially due to the fact that the sense of smell is markedly impaired, if not entirely lost, and partially the result of that loss of sensitiveness which occurs in any nerve of sensation when subjected, for a long-continued period, to the uninterrupted action of any constant impression. The general sensibility of the cavity is also somewhat impaired, though not in a marked degree. The especial liability to take cold does not, as a rule, exist, nor the susceptibility to changes of temperature and the influence of a damp atmosphere which characterizes the hypertrophic form of catarrh. The general health is not seriously impaired, and yet a sufferer from fetid catarrh is not usually in a thorough state of health. The offensive atmosphere in which he virtually and necessarily lives cannot but exercise something of a deleterious influence.

Examination.—On inspection of the nasal fossæ anteriorly in this disease, there will be noticed first the unusual degree of roominess of the cavity. The lower, and oftentimes the middle turbinated bones will be seen to be markedly atrophied. In extreme cases these bones will present as mere ridges along the outer wall of the fossa. In all cases they will be smaller than

normal, and the space between their convexity and the septum will be noticeably wide. Very frequently the pharyngeal wall will be brought plainly into view after the secretions have been removed. There will also be seen lodged in the upper portion of the cavity, greenish-yellow masses or incrustations, adhering upon and extending beneath the middle or upper turbinated bones, and wedged between these parts and the septum. They form in the lower meatus and on the floor of the nares, but the sufferer can more easily detach them from this locality by voluntary effort, hence they are not so frequently met with here. When noticed in this region they are small incrustations, while in the upper portion of the fossæ they form large accretions which mould themselves to the cavity. They are of a greenish-yellow color, and evidently of a purulent character, in contradistinction from the grayish color of the inspissated mucus, which forms the incrustation in ordinary dry catarrh. An examination of the posterior nares will reveal the same appearances, but in a more limited extent. This disease is essentially an affection of the anterior and narrower portions of the nasal cavities, and does not extend to the posterior and wider portion. There will be seen, however, small masses, of a bright yellow, or blackish-yellow color, lodged, in a majority of cases, on the under side of the middle turbinated bones, and occasionally on the face and under side of the upper. As seen in this manner, the masses have more of a purulent character, and there is less of an admixture of particles of dust and other impurities, which lodge upon the mass anteriorly. The vault of the pharynx will be found, on inspection, the site of a thick, dry, tenacious plug of inspissated mucus; in other words, in this locality there will be found a condition of dry catarrh. As already intimated, this region does not become the seat of a purulent or fetid catarrh, and if the secretion here is noticeably of a purulent character, either fluid or inspissated, the source of the pus must be sought for in the nasal cavity proper.

After the nasal passages have been thoroughly cleansed, there will be found to exist a fairly healthy lining membrane, the only departure from the normal condition being in the atrophy of the turbinated bones, resulting in the unusual roominess of the passages. In cases of long standing there may be found superficial erosions of the membrane, but these are comparatively rare.

Prognosis.—This affection is usually classed among the intractable and oftentimes incurable diseases. I regard it as quite amenable to treatment, if the measures to be detailed are carried out faithfully, persistently, and with thoroughness. It is not possible to give assurance in every individual case that a permanent cure can be accomplished, but it is warrantable to assure the sufferer that with certainty most of the more offensive features of the disease can be removed, and that in the majority of cases the disease can be permanently cured. It is not safe to venture an opinion as to the length of time which will be necessarily consumed in the treatment of these cases; the judgment will be based on the duration and character of the disease, and also on the immediate success attending the earlier measures adopted for its relief.

Treatment.—The first indication for treatment will be the removal of the crusts and masses from the cavity. This cannot be done by the douche or atomizer, but the crusts should be first moistened and softened by syringing into the cavity from behind the palate with the post-nasal syringe, the fluid used being one of the cleansing solutions given in the Appendix. It will be necessary then to detach the masses by means of a slender probe wrapped with a pellet of cotton. This should not be done blindly, but the nasal speculum being inserted, the cavity should be illuminated, and the movement of the probe directed by ocular inspection. In this manner it will be feasible to thoroughly cleanse the whole of the membrane lining the cavity. Occasionally it will be found of advantage to throw the cleansing solution against the incrustations through the nostril, using for the purpose a barrel syringe with a long slender nozzle. The success of the cleansing process should be repeatedly verified by inspection anteriorly and posteriorly. Wherever it is feasible to make use of sunlight in treating these cases, it is of very great assistance, as by its use no portion of the cavity need escape inspection.

After the cavity is thoroughly cleansed, and seen to be so by inspection, there should be applied, preferably by the atomizer, one of the following:

℞. Potassæ permanganat..... gr. x.—xx.
Aquæ..... ℥j.
M.

℞. Liq. sodæ chlorinatæ..... ʒ ss.
Aquæ..... ℥ j.
M.

℞. Acidi carbolici..... gr. v.—x.
Aquæ..... ℥ j.
M.

℞. Acidi salicylici..... gr. iij.—v.
Aquæ..... ℥ j.
M.

Finally there should be applied, by means of the insufflator shown in Fig. 47, the following:

℞. Iodoformi,
Tannin.....āā ʒ j.
Lycopodii..... ʒ ij.
M.

This should be applied through the nostril, and also thrown into the posterior nares from behind the palate. The amount of the powder thrown in should be quite limited, the object being to deposit a very thin film upon the lining membrane of the cavity.

The plan of treatment outlined above would seem a very simple one, and yet its success is entirely dependent on the thoroughness with which it is carried out. By careful and painstaking attention to the directions above given, the plan will prove successful in a large majority of cases; if on the other hand one is content to depend on the efficacy of the douche or spray, with some simple disinfecting solution, and without any preparatory cleansing, the disease will certainly prove an obstinate one to deal with.

At the commencement of a course of treatment the patient should be seen daily; as improvement is noticed, however, these frequent visits will not be necessary.

It is well to direct that a patient use at his home some mild alkaline and disinfectant solution, as follows:

℞. Acidi carbolic..... gr. x.—xx.
Sodæ biborat..... ʒ j.
Aquæ..... Oj.
M.

This may be used with the small atomizer (Fig. 63), or better still with the post-nasal tube connected with the Davidson syringe (Fig. 55). Patients are very easily instructed in the management of this douche, and its use is attended with excellent results; its especial value lies in the fact that the fluid can be thrown with such force that it reaches the whole of the upper region of the nasal cavities, and also detaches more of the inspissated masses than the spray apparatus can do. The Weber nasal douche is of limited value in this affection, as failing to reach the whole of the diseased surfaces, and as pouring a very sluggish and indolent stream through the cavities.

Ozæna.

The affections already described are very properly designated as varieties of nasal catarrh, being diseases of the lining membrane of the nasal cavities proper. They have been described as being the result of morbid changes in the mucous membrane, which are identical in each form of the disease, viz., in an abnormal deposit in the membrane of its normal elements, giving rise in one case to what was called a hypertrophic catarrh, in another to atrophic catarrh, and finally to a fetid catarrh. There is still another form of nasal catarrh, occasionally met with, characterized by an offensive discharge, but the source of the disease is not in the nasal passages, but is in the accessory sinuses; retaining the name of nasal catarrh, and confining it to affections of the nasal mucous membrane, we use the term ozæna to designate this disease.

It has been the custom to call every disease of the nasal cavities attended with an offensive discharge and fetid breath, ozæna. The name is derived from the Greek word, *ὀξαινῶ*, to stink, and is used somewhat carelessly. There are a number of diseases of the nose which are attended with an offensive discharge, as in addition to the one already described as fetid catarrh, this symptom is prominent in syphilis, ulceration from the presence of foreign bodies, scrofula, etc.

The form of disease to which the name ozæna should be restricted, is that which we find attended with the discharge of foul and offensive crusts and masses from the nose, of a fetid odor, and in which the most careful examination fails

to reveal the source of the disease in the nasal mucous membrane. The disease is not in the nasal cavity proper, although the prominent symptoms are manifested therein. Dr. Carl Michel, of Cologne, as far as I know, first called attention to the fact, that in these cases the source of the trouble could be traced to the accessory cavities, and my own observations lead me to adopt this view as the true one. In simple ozæna, then, the real disease consists in a catarrhal inflammation of the mucous membrane lining one of the accessory cavities. These are the sphenoidal and frontal sinuses and the antrum of Highmore. As a consequence of their position, size, and shape, and being almost completely closed cavities, it is easy to understand how a simple inflammation of their lining membrane will very rapidly degenerate into one of the morbid conditions characterized by a purulent discharge, the secretions being retained, soon undergoing decomposition. As the result of the accumulation of these morbid products in the accessory cavity, it becomes distended, and the discharge, now of an offensive character and with a fetid odor, overflows and escapes from its orifice into the nasal cavity, where it diffuses itself over the mucous membrane, and drying, forms a thin greenish-yellow, closely adherent pellicle.

As more of the discharge is poured into the nares, it piles up, as it were, and forms thick masses or crusts. These crusts adhere very closely to the parts, and the sufferer finds it extremely difficult to detach them. As the result of the localized irritation due to the presence of these masses, superficial erosions of the mucous membrane may occur, which, bleeding easily, serve to discolor the crusts with blood.

The prominent symptom of ozæna is the offensive discharge from the nose. This may be very profuse in amount, consisting in the daily discharge of large masses of inspissated muco-pus, mixed with blood and such impurities as may be lodged upon them from the inspired air; attended also with more or less fluid discharge of a muco-purulent character. The breath also is very offensive, from the fact that it necessarily passes over the decomposing and fetid masses, and becomes impregnated with the ill-smelling emanations which arise from them. This fetid breath is often so penetrating and nauseous as to render the near presence of the sufferer not only unpleasant, but almost unendurable. The odor, however, of simple

ozæna, is not so offensive as a rule, as that of syphilitic disease of the nose.

The causes of ozæna cannot be laid down with any great degree of certainty. It may occur as the result of a state of ill health from any cause, and perhaps does so occur with more frequency than in fair health, although it is frequently met with in persons of sound constitution and robust physique. Where we meet with ozæna, however, in persons whose general health is impaired, we will often find that at the commencement of the disease the condition of the patient was one of robust health, and that this has become impaired by the disease itself. This commences as a purely local affection, and remains a local affection; but the fetid odor which acts to poison every breath of inspired air, compels the sufferer to live virtually in an impure atmosphere which cannot but have a deleterious influence on the best of constitutions. A frequent source of ozæna is disease of the antrum of Highmore, caused in the majority of cases, by carious teeth whose roots project into the floor of the cavity. Occasionally it may, in this locality, give rise to neuralgic pains referable to the side involved, but this is comparatively rare, not only with reference to the antrum, but to all the cavities; the prominent symptoms being the offensive discharges and the impaired health resulting therefrom. As regards the disease having its origin in other cavities we can simply say that it is generally due to an acute coryza extending to the mucous membrane in these localities. While the acute process subsides in the nasal cavities proper, in the accessory cavities it lapses into a chronic inflammation, and finally, on account of its surroundings, takes on a purulent character.

The disease essentially belongs to the anterior nasal cavity, as it is here that the symptoms manifest themselves, that the morbid conditions are seen on which the diagnosis is based, and to these parts, mainly, that the efforts of treatment are directed. The pharynx is not involved in the affection to any extent, and an inspection by the rhinoscopic mirror reveals but little of the morbid condition.

Examination.—An inspection of the parts through the nostril will bring into view the lower and middle turbinated bones, and a large part of the septum. These will be found coated almost completely by a thin greenish-yellow, closely adherent

pellicle which seems to fit itself to the whole lining of the cavity as far as seen. In the upper and back portion of the cavity there may be seen a thick, heavy mass of inspissated muco-pus clinging about the orifice of the sphenoidal sinus. Or again, there may be brought into view a mass clinging near the opening into the antrum.

The nasal cavity being cleansed it will be seen that its mucous lining is quite healthy in appearance, except that it is somewhat congested as the result of the measures used to cleanse it. It is often said that the morbid condition in ozæna is one of ulceration. This is not true, for the most careful inspection fails to reveal it. There may be slight erosions of the membrane as the result of the irritation of the dried masses of pus, etc., adhering to it. Genuine ulceration, however, does not occur, and by ulceration, it should be stated, is only meant a solution of continuity, with progressive loss of tissue. Ulcerative action rarely takes place, except as the result of some profound dyscrasia, or blood condition, as in syphilis, tuberculosis, scrofula, etc. Another condition that will be prominently noticeable on inspection is the extreme degree of roominess of the nasal cavity. This is due to a shrinking of the turbinated bones. This is to be accounted for in a manner similar to that given in connection with the same appearances in fetid catarrh. The pus being poured into the nasal cavity and diffusing itself over the turbinated bones, loses its moisture rapidly, and in drying undergoes contraction. The thin, dry pellicle thus formed, exercises pressure on the parts beneath with the result of causing their atrophy. As the result of this the cavity is noticeably capacious, so much so that the pharyngeal wall can often be seen by inspection through the anterior nares.

In many cases the orifices of the accessory cavities, which may be diseased, can be brought into view after cleansing the nasal cavity, plugged with a mass of inspissated pus standing out prominently in its bright yellow color, as contrasted with the red membrane around it.

Treatment.—The first indication for treatment is the cleansing of the parts. This may be accomplished by means of Dobell's solution (see Appendix), used with the post-nasal syringe (Fig. 54). If this fails to detach the adherent crusts, a probe, wrapped with cotton, or the slender forceps, may be used to detach the pellicles and masses. This procedure should be

accomplished with a great deal of care, and its success verified by frequent inspection of the parts. All the offensive masses should be removed and the cavity thoroughly cleansed. The especial solution used is not of so much importance as the thoroughness with which it is used.

If now the orifice of the diseased accessory cavity can be brought into view, this should be cleansed and opened as far as possible by such means as will easily suggest themselves, as the use of a slender probe, with a pellet of cotton twisted upon its extremity, and as far as possible the cavity itself reached for cleansing. When this has been accomplished a disinfecting solution should be thrown into it, in the form of the spray. This can only be accomplished by spraying into the nasal cavity proper, as by this method some of the atomized fluid which fills the whole nares will make its way into the diseased cavity. For this purpose there may be used permanganate of potash, creosote, or salicylic acid of the strength of from five to ten grains to the ounce. Following this there should be injected, by means of the powder-insufflator, Fig. 47, a powder composed of equal parts of iodoform and lycopodium, the latter being added to give lightness to the mass. This should be thrown not only against the orifice of the diseased cavity, but distributed very freely over the membrane of the neighboring parts. This treatment should be followed up pretty actively, at first, daily applications being often required, and the vigor of the treatment only relaxed as improvement is noticed. The important features in the management of a case of ozæna are : the recognition of the source of the disease, and the use of a certain amount of skill and deftness in reaching it for purposes of treatment. Keeping these points in view and accomplishing these ends the most obstinate case of ozæna will often yield satisfactorily to treatment, and if not entirely cured it may be held under control, and its more distressing symptoms kept in check.

CHAPTER XIV.

SYPHILIS OF THE NOSE.

The manifestations of syphilis in the nasal cavity belong essentially to the tertiary period, the earlier lesions rarely if ever being met with in this region.

Syphilitic coryza.—This occasionally occurs in the early stages of syphilis, but presents no features which enable us to recognize it as due to the specific virus, and the diagnosis depends entirely on the clinical history of the case. It occurs from six weeks to three months after the primary sore, and generally in connection with a roseola. It subsides readily under the use of constitutional remedies, and, as a rule, requires no local treatment. If, however, it should prove obstinate or persistent, resort may be had to the same methods of treatment which govern the management of a case of simple coryza.

Mucous patches.—It has been asserted by writers that mucous patches may occur about the margins of the nostrils, as they do about the orifices of other mucous tracts of the body. I have never been able to verify this assertion, and am confident that if this manifestation of syphilis does occur in the nose, it is an exceedingly rare event. When met with it would present the same appearances and require the same treatment as mucous patches in any other part.

Syphilitic Ozæna or Syphilitic Ulceration in the Nose.

Covering the period of from five to fifteen years after the primary sore, we have a series of deep-seated lesions due to the syphilitic poison, which we are accustomed to call tertiary manifestations. This is the period in which the nasal cavity is most liable to become diseased, and when this happens we have manifested certain grave and destructive forms of ulceration,

which pursuing a somewhat rapid course lead to more or less extensive destruction of tissue, involving the cartilages and bones of the organ to such an extent as often to cause permanent and unsightly deformities. The progress of the disease is characterized by the discharge of masses of pus, blood, and necrotic tissue, which become the source of a most offensive and penetrating stench. This disease is often confounded with simple ozæna, although the two affections are entirely distinct pathologically and in their clinical characteristics. A better usage, perhaps, would suggest that the name ozæna be entirely confined to the idiopathic disease, while this affection be designated as syphilis of the nose. Out of deference, however, to long-established custom the name is retained.

We meet with two forms of ulceration in syphilis of the nose: a superficial ulcer and a deep ulcer. Of these the latter is by far the most frequent, the superficial variety occurring somewhat rarely.

The superficial ulcer.—In the superficial form we meet with an ulcerative process commencing apparently on the surface of the mucous membrane, and which erodes the tissue by a somewhat slow process of destruction, spreading both laterally and also deeply. Its borders are moderately well defined, and the mucous membrane surrounding it perfectly normal in appearance, there being no areola of redness. The edges of the ulcer are neither sharply cut nor depressed; the surface, however, is somewhat depressed at its centre, while its borders are flush with the surrounding membrane. Its surface is covered with a coating of thick, stringy, grayish-yellow muco-pus. If this is removed the cleansed surface will show a grayish-pink color; it is feebly sensitive to the touch, but bleeds easily. In the majority of cases this form of ulceration is found on the cartilage of the septum, although it may extend to the bony septum, resulting in more or less complete destruction of the part.

The deep ulcer.—The other form of tertiary ulcer which is met with in the nasal cavity, in a very large majority of cases if not in all cases, is due to the deposit in the deep layers of the mucous membrane, of gummata, which becoming softened and breaking down, develop rapidly into ulcerative action. This gives rise to the deeper form of ulceration, which presents certain characteristic appearances. It is a deep, excavating

ulcer, with ragged overhanging edges ; the mucous membrane surrounding it is reddened and darkly congested ; the surface of the ulcer is covered with a bright yellow pus, mingled with more or less of blackened necrotic tissue, which results from the destructive process. This form of ulceration is met with generally on the turbinated bones, and extending deeply and laterally leads very soon to the destruction of the mucous membrane and periosteum, with resulting necrosis of the bone. A direct view of the ulcerative surface is not, as a rule, easily obtained, but the ragged, puffy appearance of the mucous membrane, with the red areola about the borders of the ulcer, and the history of the case, will always enable the physician to form a pretty accurate opinion as to what condition exists. In most cases, probably, the diagnosis can only be determined with accuracy by a thorough investigation with the probe, which will reveal very early in the progress of the disease the existence of denuded, if not necrosed bone ; for, as has been suggested, an accurate diagnosis in disease of the nose, characterized by fetid or offensive discharges, can only be attained by a thorough exploration of the cavity by means of the probe, in addition to the ordinary inspection. The existence of these two forms of ulceration is mainly a matter of clinical observation, otherwise their significance and results are much the same, as well as the symptoms to which they give rise. There is always an extremely offensive discharge, with an intolerable odor of decomposing pus and dead bone, together with a tendency to the formation of crusts or masses of dried pus, blood, and decaying tissue, which adhering closely to the ulcerated surface are only removed by violent efforts of blowing the nose, or by dragging them down with the finger or any improvised implement, which the sufferer may resort to for detaching them. When dislodged and voided their odor and appearance are unspeakably nauseating. As the disease progresses, and more extensive portions of the nasal cavity are involved in the destructive process, these crusts are formed in larger masses and in greater quantities, so that it becomes impossible for the sufferer to get rid of them, and he is only relieved at the hand of the physician, who digs them out with the probe and forceps, but only to be renewed again in the course of a few hours.

As a consequence of the morbid process, the natural supports of the contour of the nose are destroyed, and there re-

sults the familiar misshapen nose which occurs from necrosis of its bones. If the cartilaginous septum is destroyed, the lower portion of the nose is flattened. If the nasal bones are involved, the bridge of the nose sinks to the level of the cheek, while the tip projects like a rounded knob. If necrosis of the turbinated bone occurs, and it extends to the superior maxillary, there is liable to occur a swelling at the angle of the nose and cheek, producing on that side the appearances of frog face. The floor of the nares is often involved, and the process may go on to the extent of producing more or less complete destruction of the hard palate, resulting in an abnormal opening between the nose and mouth, giving rise to serious interference with swallowing and impairment of the voice. The destructive process seems to limit itself to the bony and cartilaginous structures of the nasal cavity, and does not, as a rule, extend to the soft palate, the septum alæ narium, or the cutaneous surfaces, the external deformities being confined to misshapen contour of the nose, resulting from destruction of its supports.

Diagnosis.—Syphilis of the nose is often confounded with fetid catarrh and ozæna, the other forms of disease of the nose which give rise to offensive odor and discharge. The diagnosis is comparatively easy if a thorough and satisfactory ocular inspection is obtained of the cavity, and is based on the examination through the anterior nares which brings into view the parts mainly involved in the disease.

Examination.—On first inspection in either of the different forms above described, the appearances are very much alike. There is simply brought into view one or both cavities filled with dry, offensive looking crusts or fetid masses, which cover and conceal the condition of the parts beneath. If, however, by one of the methods above described, these be removed and the cavity thoroughly cleansed, an examination will reveal, in ozæna and fetid catarrh, that the mucous membrane and walls of the nares are intact, while in syphilis there will be brought into view either ulcerations on the septum or turbinated bones, or more or less destruction resulting from necrosis. Keeping in view the fact that ulcerations never occur except as the result of some blood disease, and that the diseases which may produce it are syphilis, scrofula, tuberculosis, cancer, and the exanthemata; and furthermore, remembering that, if these ulcerations are due, not to syphilis but to one of the other

affections, other symptoms characteristic of the special disease will be well marked, the diagnosis becomes comparatively simple. In other words, if we meet with a case of destructive ulceration or necrosis in the nose in a patient not showing well-marked evidences of impaired health due to scrofula, etc., we may with almost absolute certainty say that the disease is syphilis. This is true, often, even if the previous history of the case is not perfectly clear as regards the primary sore and subsequent specific manifestations. In a number of cases which have come within my own observation, the disease has developed in the nose after a period of time from ten to twenty years, subsequent to the primary lesion, and during which time there had been no manifestation of the disease. Remembering then how comparatively trifling a sore the primary lesion may be, and how liable it is to be overlooked, the possibility of tertiary syphilis occurring in the nose, without any satisfactory history of syphilis preceding it, should be borne in mind.

Treatment.—The proper management of syphilitic disease of the nose involves both general and local treatment, the former being always essential in controlling the disease, and the latter of the utmost importance as limiting its destructive ravages and expediting a cure. In my own experience, mercury is of very limited value, in syphilis of the nose, as controlling and influencing the ulcerative process. The administration of the iodide of potash is, however, attended with most satisfactory and often even brilliant results. This should be given from the onset in full doses, and the amount gradually increased until a dose is reached, by the administration of which very decided improvement is noticed. This should be maintained until the desired end is obtained, unless contra-indicated by the occurrence of the eruption, coryza, or other symptom of iodism. The plan I usually pursue is as follows: commencing with fifteen grains three times daily, three grains is added to the amount each day until either decided improvement is noticed or symptoms of iodism produced.

In addition to constitutional remedies, active local treatment should be resorted to in order to control the destructive progress of the disease, to correct as far as possible the offensive odor, to limit the secretion, and to remove dead bone, which acts as a source of irritation and encourages ulceration, or rather interferes with reparative processes. The first step

should be the thorough removal of all the masses and crusts which cover the diseased part. This should be done by means of the post-nasal syringe discharged behind the palate or through the anterior nares, with the use of one of the cleansing solutions given in the Appendix. If the syringe does not serve to cleanse the part, the forceps or probe should be resorted to. If now there is found simple ulceration, without necrosis, the surface of the ulcer should be covered with iodoform. This at the commencement of treatment should be done as often as possible, certainly two or three times each week, if not every day. But as the disease commences to yield to treatment, an improvement being noted, less close attention will be sufficient. The second end to be accomplished in the local treatment is the removal of the offensive secretions and the correction of the fetor which not only renders the sufferer's presence offensive to those about him, but also poisons the atmosphere in which he himself lives and breathes. This is to an extent accomplished by the cleansing process, but in addition to this there should be used some disinfectant as follows: carbolic acid, gr. v.— ʒ j., creosote, ♏v.— ʒ j., liquor sodæ chlorinatæ, ʒ j.— ʒ j., permanganate of potash, gr. xx.— ʒ j. These may be used with the post-nasal syringe in front or behind, but better still with the atomizer, as by this means they penetrate the whole of the nasal cavity and reach portions not so liable to be medicated when the syringe alone is used. In addition to this at the hands of the physician, it is well that the patient also should have some means of treating his disease at home. This may be done as suggested with reference to nasal catarrh, and should consist in the use, night and morning, of a solution of carbolic acid or permanganate of potash, or liquor sodæ chlorinatæ, by means of the small atomizer, or by the nasal douche. In this disease the nasal douche is of undoubted value, as the diseased condition is, as a rule, in that portion of the cavity which is reached by the fluid used in the douche. The only difficulty in its use, however, lies in the fact that the diseased surface is ordinarily covered by dried crusts, and that these are bathed by the fluid, rather than the disease itself. This may be obviated to an extent by directing the patient as far as he is able by voluntary effort to expel the masses before using the douche. This plan for disinfecting is of value not only in the ulcerative stage, but in necrosis as

well. If necrosis exists, the dead bone should be gotten rid of as soon as possible; this may be accomplished by any of the simple means which are familiar to every physician, and under the rules which govern the management of necrosis when met with in any part of the body. If the extent of necrosis is limited, the measures already devised will be sufficient to arrest its further progress, and the superficial laminæ gradually giving way, the healthy membrane will close over the part and the cure be accomplished. If the necrosis involves the septum, and perforation has occurred, the ragged edges of the dead bone should be cut away or ground off, in order to allow the membrane of either side to unite with its fellow and form a healthy margin to the new opening. If the turbinated bone is involved, it will oftentimes become necessary that the whole bone should be removed. Dr. Goodwillie, of this city, has reported very excellent results in the management of this disease, by the use of the dental engine, which enables him to reach with ease and precision through the nostril any dead bone that may exist, and to grind it off by operating through the same entrance. The duration of the disease can be greatly curtailed by the removal of dead bone wherever found, and this should be done in all cases where it is feasible. If the cartilaginous septum is involved, it may be punched out or cut with a strong knife. The after rules for the management of this affection consist in the administration of mercury in small doses, over a period of from twelve to eighteen months. We probably possess no better remedy than the bichloride of mercury, and after the disease in the nose has subsided, this should be given. If the drug acts on the bowels too freely, minute doses of opium may be combined with it.

CHAPTER XV.

SURGICAL AFFECTIONS OF THE NOSE.

Tumors of the Nasal Cavity.

The tumors that occur in the nasal cavity are myxomata or gelatinous polypi, fibromata or fibrous polypi, adenomata or adenoid tumors, and malignant tumors. In addition to these we occasionally meet with small warty growths about the nostrils. The discussion of malignant growths of the nose belongs more properly to works on general surgery and the subject will be omitted here, in that they present no especial features, when growing in the nose, different from those which are manifested in any other portion of the body. Warty growths are frequently seen, especially in children, just within the nostril at the muco-cutaneous junction. They present the same appearances as when met with on the skin or other portions of the body. Their main importance is in the tendency in children to pick at them and irritate them until bleeding is excited which may become serious in extent. They should be removed by the scissors or any of the ordinary methods, and their base touched with nitric acid. Adenoid growths or glandular hypertrophy have already been referred to in the article on the hypertrophic form of nasal catarrh, and sufficiently noticed. But two forms of new-growths, the gelatinous polypus and fibrous tumors, remain for consideration.

Myxomata or Gelatinous Polypi.—The gelatinous polypus, or, as it is sometimes designated, the nasal polyp, is the most common of all tumors which have their seat in the nasal cavity. Taking their origin in some small point of localized inflammation, and probably in one of the minute glands of the mucous membrane, they grow with more or less rapidity until they project into the cavity, and by their own weight sink down toward its floor, becoming somewhat elongated and pear-

shaped, their attachment to the part from which they sprung being maintained by a narrow portion called the pedicle. (See Fig. 104.) As they increase in size they mould themselves to the cavity in which they grow. In the majority of cases their attachment is to the middle turbinated bone, about midway of the passage. They rarely, if ever, spring from the septum or floor of the nares. As a rule they occur in groups of from three or four to eight or ten, and are rarely confined to one cavity. They are soft, yielding, and semi-elastic to the touch. If a probe is pressed against them they are easily indented, their contour being restored somewhat sluggishly. They are of a grayish color, with a glistening surface, and have something of the appearance of a mass of thick mucus. They are composed mainly of loose fibres of connective tissue, with some glandular tissue and a few epithelial cells, and embrace within their meshes a large amount of mucin which is their principal constituent.

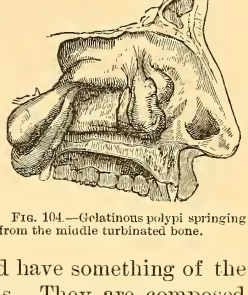

Fig. 104.—Gelatinous polypi springing from the middle turbinated bone.

The prominent symptoms of their existence are : obstruction of the nose more or less complete, according to their size and number ; the discharge of a clear watery fluid, and their peculiar action under atmospheric changes by which they absorb moisture and swell up during damp weather. This hygroscopic character of the gelatinous polypus is due probably to endosmotic action. The voice is affected simply in the nasal stenosis which they cause, which robs it of its normal nasal tone. The discharge is somewhat irritating in character, so much so that the margins of the nostrils are frequently reddened and inflamed by its local action. The conjunctiva also is liable to reflex irritation by which there is often marked congestion, with an excessive secretion of tears. The appearance of the patient is often markedly suggestive of one suffering from a cold in the head. There is the same peculiar vacancy of expression, with suffusion of the eyes and profuse discharge from the nostril. The nasal membrane is extremely sensitive, and sneezing is a prominent symptom of the affection, occurring as it does in frequent and often violent and prolonged attacks.

The diagnosis is quite simple, the group of subjective symptoms to which the existence of the gelatinous polypus gives rise being peculiarly and pointedly suggestive of that affection. In addition to this an inspection through the nostril will readily bring into view the tumor, more or less completely filling the nasal cavity, and which will be recognized by its grayish color, moist, glistening appearance, and semi-elasticity to the touch, together with its movability, for if it be pressed backward by the probe it will be found to move quite freely, showing it to be attached by a pedicle rather than by a broad base, to the parts beneath.

Treatment.—The tendency of these tumors is almost invariably to recur after removal. The explanation of this is that, undoubtedly, in many cases the whole tumor with its attachment is not removed, but that sufficient of the polyp remains as a nucleus from which a new crop may develop in the same manner as before. The proper management then of these polypi consists not only in the removal of the tumors, but also in the complete destruction or ablation of their attachments or the removal of the root, as it is sometimes called.

There are three methods of treating gelatinous polypi which may be alluded to: by injection, evulsion by forceps, and removal by the snare. It is claimed that by throwing into the mass of the polyp a few drops of glacial acetic acid, by means of the hypodermic syringe, that the tumor will shrivel up and drop out. This procedure is extremely attractive by its simplicity, but unfortunately it does not accomplish the purpose. I have never succeeded in accomplishing, by this plan, what is claimed for it. Furthermore, it is doubtful if by this procedure the whole mass, together with its attachments, can be destroyed. Hence, even if the bulk of the tumor were destroyed, it would certainly recur again.

From time immemorial it has been the practice to remove nasal polypi by means of the forceps. The plan recommended is to pass the forceps between the tumor and the turbinated bone, and to seize the pedicle, and twist or tear it from its attachment. The manipulation of the instrument is guided mainly by the sense of touch, as it is rarely, if ever, possible to bring into view the pedicle of a polyp. It is also borne in mind, to aid in the manipulation, that in the very large proportion of cases the attachment is to the middle turbinated bone. The

first attempt to seize a polyp by means of the forceps, necessarily excites a considerable hemorrhage from the mucous membrane, which serves to render still more obscure the manipulation. The operation, therefore, is very much in the dark. It is taught, that by careful manipulation the operator will be enabled to feel his way, as it were, by means of the instrument, and that he can recognize the peculiar, soft tissue of the polyp when he has seized it within the bite of his instrument. The movement of the forceps is necessarily much hampered in the narrow passage of the nose, and cramped somewhat, hence it is very doubtful if this recognition is possible. The evulsion of a polyp then becomes simply a blind groping in the sensitive nasal cavity, with a harsh, rude instrument, in which there may be seized and torn away the polypus, its pedicle, the mucous membrane, or even the turbinated bone. The operation is extremely painful, and is attended with excessive hemorrhage. It may succeed in removing the entire tumor with its attach-

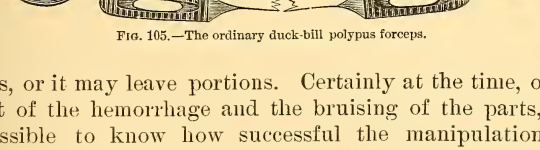

FIG. 105.—The ordinary duck-bill polypus forceps.

ments, or it may leave portions. Certainly at the time, on account of the hemorrhage and the bruising of the parts, it is impossible to know how successful the manipulation has been. In view then of the fact that we have a much better resort in the use of the snare, for the removal of gelatinous polypi, the operation of evulsion by forceps should be condemned as unsurgical, and often cruel in the excessive and unnecessary pain caused, and brutal in the rough usage to which the healthy tissues are subjected.

There may be cases occasionally in which it becomes necessary to resort to the use of the forceps. Fig. 105 shows the ordinary duck-bill polypus forceps. The objection to this instrument lies in its having a broad flat blade, whereas it is intended to be inserted into the narrow vertical fissure between the polyp and the outer wall of the nasal cavity. In addition to this, the bite of the instrument comprises a very small portion of the blade. Fig. 106 shows an instrument constructed on the proper

principle. The blades are long, slender, and tapering; they are narrow in their transverse diameter, while they are made strong by being reinforced in their vertical thickness. The toothed bite of the blade comprises nearly its entire length beyond the joint. As will be perceived, on account of its shape, the former instrument can only be passed into the cavity by forcing its way between the tumor and the turbinated bone, while the latter can be inserted with comparative facility.

The use of the snare is unquestionably the least painful, the easiest, and the most thoroughly surgical procedure we possess for removing nasal polypi. Of the various instruments of this class, Dr. Jarvis' instrument, Fig. 100, is the simplest and most efficient. It is so much superior to any other device within my knowledge that further allusion to instruments of

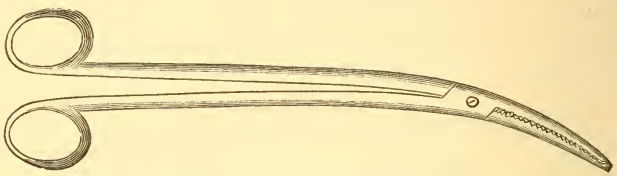

Fig. 106.—Polypus forceps with narrow and tapering blades.

its class is omitted. Its working needs but brief notice. It is mounted with either annealed wire or fine piano wire, leaving a small oval loop projecting from a half to three-quarters of an inch. Passing the loop between the polypus and the septum, and turning it under the tumor, it is easily carried by a gentle motion to its attachment, when by holding the shaft of the snare firmly against the turbinated bone, from which the polyp springs, the pedicle can be leisurely cut through, and the tumor withdrawn with the instrument. Both the placing of the loop in position and the removal of the tumor are nearly painless, and attended with no hemorrhage whatever. The absence of bleeding renders it a very simple matter to proceed with the operation, and remove successive tumors as they come into view by the removal of their fellows. I have frequently at a single sitting removed numbers of polypi from each nasal cavity by this method, without hemorrhage, and with nothing more than the slight irritation of passing the wire into the cavities. After the removal of polypi, it is best, as a rule, that the

part from which they are severed be cauterized by nitric acid or the galvano-cautery, in order to guard against their recurrence.

Voltolini and others recommend the use of the galvano-cautery for the removal of nasal polypi. The only advantage to be gained by its use would be in the coincident cauterization of the attachment of the tumor, otherwise the simple wire snare possesses all of its advantages, and, in addition, is much more easily manipulated and causes no pain. The cautery necessarily causes considerable pain at the time of the operation, and also entails a week of no little discomfort from the irritation and swelling of the parts, which results from its use.

As a matter of certainty in preventing a recurrence, as before remarked, it is well to cauterize the parts after operating with the snare; nevertheless, I am disposed to think that in many cases, if the instrument is properly and skilfully manipulated, that a radical cure is effected by its use. By pressing the loop firmly against the turbinated bone, not only is the polyp removed, but a sufficient portion of the mucous membrane is engaged to insure the complete ablation of the polypus-breeding tissue.

Fibromata or Fibrous Polypi.—Fibrous tumors of the nose are of much rarer occurrence than those previously described, but they are far more serious in their import. They spring from the deep layers of the mucous membrane or periosteum, and are composed mainly of fibrous tissue, closely interlaced and embracing within its meshes a few connective-tissue cells and a somewhat scanty supply of blood-vessels. As a rule they spring from the posterior portion of the nasal cavity proper or vault of the pharynx, their attachment being to the basilar process of the occipital or to the sphenoidal bone. Their growth is extremely slow, extending in every direction, and sending prolongations into neighboring cavities, but they extend by a resistless progress which nothing can withstand, carrying before them in their relentless march, membrane, cartilage, and bone, or whatever may stand in their way. The symptoms at the onset are merely those due to nasal obstruction without any noticeable catarrhal discharge, together with recurrent and often dangerous attacks of profuse hemorrhage from the mucous membrane surrounding them, which is much congested, and liable to become the seat of superficial erosions.

As they increase in size, and extend into the nasal cavity proper, they give rise to that peculiar deformity which is called frog face, due to the crowding forward of the re-entrant angle between the nose and cheek bone. The diagnosis is easily made by inspection and palpation.

Treatment consists in their removal by means of the forceps, the wire loop ecraseur, or by the use of the galvano-cautery. Access to these tumors may be obtained by opening the nasal cavity from in front, by dissecting up the face by incisions commencing at the angle of the lip and jaw, and carrying the dissection upward until the upper lip and nose and cheek can be laid over upon the forehead, thus laying bare the bony orifice of the anterior nares. This is the operation of Bronge.

Another and less formidable operation consists in making an incision from the inner angle of the eye to the angle of the mouth, and turning the nose to the opposite side by dissecting up the flap, thus reaching the same result of gaining a wider access to the nasal cavity. This is the operation of Langenbeck. Another method of reaching these tumors consists in making an incision through the soft palate, and, if necessary, extending it through the bony palate, thus gaining free access to the mass, which is then seized by a pair of stout forceps and torn and wrenched out. The cleft palate is then to be restored by another operation. The nicer manipulations brought into use since the introduction of the laryngoscope enable us to reach these tumors without involving the serious results of such formidable operations as the above. After a thorough investigation of the size and character of the tumor and the site of its pedicle, the wire loop being passed round it, it may be severed by the ecraseur, or, what is preferable, the platinum wire having been passed, the pedicle can be cut by the galvano-cautery and the tumor removed through the pharynx. The advantage of this latter procedure consists in the freedom from hemorrhage. At best, however, this is liable to occur, and to an extent which is often most formidable, and the ingenuity and skill of the surgeon will often be put to a severe test in dealing with these troublesome cases, especially if the tumor has grown to a large size, as they not infrequently do, to the extent of filling up the anterior nasal cavity and even protruding from the nostrils. This extent of growth would necessarily interfere somewhat with the placing in position of the wire loop. Dr. Lincoln,

of New York, has reported some very successful operations on these large tumors in which their size was much reduced by the electrolytic needles before the radical operation was undertaken.

Another method of dealing with these tumors consists in placing a ligature around the pedicle in such a manner that it can be gradually tightened until it cuts its way through. The tumor is strangulated by this procedure, and, of course, becomes necrosed. The discharges as the result of this plan become extremely offensive and almost unendurable. This necessarily would render the procedure objectionable. Furthermore, if it is feasible to pass a ligature around the pedicle it is quite as feasible to pass the galvano-cautery wire, and hence the more rapid operation would seem the better one.

It is claimed that the injection of the tumor with a strong solution of chloride of zinc will cause the growth to slough and come away. The same may be said of any of the escharotics, probably. The main objection to this plan of treatment would be in the intolerable stench which would necessarily attend the destruction of the mass. Occasionally these tumors undergo resolution, but such a fortunate accident is very rare.

Epistaxis or Nose-Bleed.

The mucous membrane of the nasal cavity is very abundantly supplied with blood-vessels, more so probably than any other portion of the air-passages, and owing to its exposed position and its liability to injury or irritation, bleeding is of extremely frequent occurrence. This may be the result of direct violence, as a blow or fall; it may occur from picking the nose when it is the seat of disease or irritation, or it may be due to an effort on the part of nature to relieve the surcharged blood-vessels of the head, when from any cause the cerebral circulation is distended. In this latter case the bleeding is preceded by a sense of fulness about the forehead and eyes, frontal headache, dizziness or vertigo, intolerance of light, etc., all the symptoms disappearing with the escape of blood. Nose-bleed frequently marks the onset of typhoid or remittent fever, in which case it is accompanied by the ordinary symptoms of these diseases. It is also a prominent feature of scurvy, in which case it will probably be accompanied by bleeding from

the gums and the characteristic blood spots upon the skin. It is said to take place at the monthly period, giving rise to the so-called vicarious menstruation, recurring as it does each month at the time when the natural flow should appear, and which from some cause is suppressed. It occurs also in persons suffering from the hemorrhagic diathesis under the influence of which any slight cut in any portion of the body is attended with violent and almost uncontrollable hemorrhage. If the bleeding is due to local causes, it is generally confined to one nostril, but if the cause is in a general condition, such as typhoid fever or scurvy, congestion of the blood-vessels of the head, etc., it flows from both sides of the nose. It usually trickles in drops, or flows in a small stream, and is not attended by any great danger, but it may become very serious or even fatal by its amount or long continuance without arrest.

Treatment.—In the majority of cases, probably, the tendency of nose-bleed is to cease spontaneously, still it is not well to trust to this tendency, for if it lasts too long it is far more difficult to arrest it than at the onset. Hence, simple measures should always be resorted to, such as pressing the nose firmly between the thumb and finger, thus closing the nostril, and as much as may be of the nasal cavity, at the same time raising the hand on the bleeding side as far as possible. This position should be maintained from five to ten minutes or even longer, the object of the procedure being to enable a clot to form by which the bleeding vessel may be plugged. Blowing the nose should be avoided, not only during the bleeding, but some time afterward, the effect of such an act being to dislodge the clot and re-establish the trouble. Resort at the same time should be made to the application of ice to the nose and also to the nape of the neck. In the absence of ice a piece of cold metal may be used. These measures failing, a further resort is to tie a cord round one of the limbs, thus lessening the amount of blood which circulates in the vessels of the head, by detaining it in the extremities. If the hemorrhage is not arrested by these devices it will be necessary to use local applications such as persulphate of iron, ferric alum, tannic acid, gallic acid, about twenty grains to the ounce of water, which may be thrown in by the syringe or by the atomizer. If, however, the hemorrhage has been long continued and the patient shows evidences of suffering from

loss of blood, as manifested by pallor in the face, weakness, vertigo, etc., time should not be wasted in the above procedures, but the physician should immediately resort to plugging the nostrils. Various devices have been resorted to for accomplishing this; prominent of course among them is the traditional method by the use of Bellocq's canula, shown in Fig. 107. By this instrument a thread is carried through the nostril into the pharynx, where it is seized by the forceps and brought out through the mouth and the instrument withdrawn. The cord will thus be so placed that one end hangs from the nostril and one from the mouth; these two ends being tied together, there should be fastened in the circuit of the cord a pledget of cotton, well oiled, which is now carried behind the soft palate and into the posterior nares, by traction

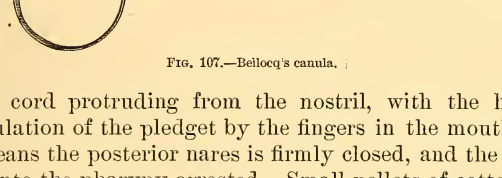

FIG. 107.—Bellocq's canula.

on the cord protruding from the nostril, with the help of manipulation of the pledget by the fingers in the mouth. By this means the posterior nares is firmly closed, and the flow of blood into the pharynx arrested. Small pellets of cotton may now be packed into the nostril, and the hemorrhage will be under perfect control. The loop of the cord should now be drawn to one side and fastened to the ear. The pledget can be left in position from twelve to twenty-four hours, when it may be safely withdrawn by traction on the cord passing out of the mouth. This procedure is more easily described than performed, as in many cases the extreme irritability of the nose will render its performance very difficult. A procedure to which I have often resorted for controlling obstinate hemorrhage, is to pack the nasal cavity with small pledgets of cotton from in front, the pledgets being soaked in some mild styptic such as a twenty-grain solution of ferric alum, persulphate of iron or tannic acid, etc. These little pledgets being passed into the nostril can be carried back to the posterior nares by a pair of slender forceps or probe, and gradually building up

by the additional pledgets the nasal cavity can be plugged very efficiently and without involving the difficulties and struggles necessary to accomplish the same end by Bellocq's canula.

Dr. Robinson, of this city, has suggested for arresting epistaxis, the introduction into the nasal cavity of a thin rubber air-bag, which, when in situ, can be inflated. For this purpose the simple toy balloon sold on the streets may be used, being fitted on a catheter.

Another suggestion that has been seriously made is that of filling the nasal cavity with plaster-of-Paris, freshly mixed with water. This may be an efficient method of controlling the nose-bleed, but the difficulty would be in removing the plaster-of-Paris afterward.

Any of the methods of passing a cord for tying the palate, described on page 29, are, of course, applicable for plugging the nares.

Deviation of the Septum.

This deformity is one of extremely frequent occurrence ; but in the large majority of cases it exists to so slight a degree that it gives rise to no inconvenience. Occasionally, however, it is met with where the deflection exists to such an extent as to cause a considerable degree of annoyance by the partial or even complete obstruction to nasal respiration. The deformity consists in the projection of the cartilaginous septum to one or the other side, generally to the left, the projection assuming the shape of an angular indentation.

The diagnosis is quite simple, as it can generally be made by the appearance and feeling to the touch of the prominent mass in the obstructed nostril. The only condition with which it is liable to be confounded is that of a neoplasm ; but the diagnosis becomes clear by an inspection of the other nostril which will reveal a corresponding depression. It is usually produced by a blow or fall upon the nose, although it not infrequently is a congenital condition. It often occurs in connection with fracture of the nasal bones, although it is more commonly met with independently of this condition. If the deviation occur in but a moderate degree the resultant symptoms are not sufficiently prominent to indicate treatment. In these cases, however, in which the deformity leads to marked obstruction to

nasal respiration, the condition will often demand relief at the hands of the physician.

The part involved by the deformity being a thin and somewhat tractable plate of cartilage, it becomes quite feasible to seize it by a properly constructed pair of forceps, and force it into a direct line with the vomer. This is the plan recommended by Adams, who published in the *British Medical Journal*, October 2, 1875, an account of several successful operations

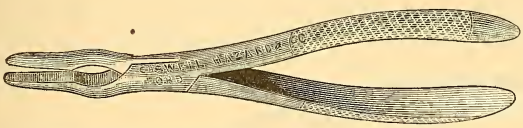

Fig. 108.—Adams' forceps for the deposition of a deviated septum.

of the kind. He used for the purpose a pair of strong forceps with flat parallel blades, shown in Fig. 108. The patient being under an anæsthetic, one blade is inserted into each nostril, and the deflected portion being grasped is wrenched into position. After this operation there is applied to the broken septum a retentive apparatus shown in Fig. 109. This consists of a pair of flattened plates mounted with a hinge and worked

Fig. 109.

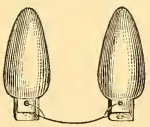

Fig. 110.

Fig. 109.—Adams' screw compressor plates for deviated septum.
Fig. 110.—Adams' ivory plugs for the nostril.

by a screw. One blade is inserted into each nostril and the screw tightened sufficiently to retain the cartilage in position without making pressure on it. This apparatus is worn continuously for three or four days and nights, after which the ivory plugs shown in Fig. 110 are introduced, and are to be worn until the cartilage has become firm. These plugs the patient can introduce or remove at pleasure.

Another method of remedying a deviated septum consists in cutting out the offending portion of cartilage. This pro-

cedure, of course, establishes an artificial opening in the septum ; but this is not sufficient to weaken the supports of the nose, and gives rise to no untoward symptoms. The operation, therefore, is a perfectly justifiable one. This may be accomplished by means of Blandin's punch shown in Fig. 111, which is fashioned after the ordinary shoe punch, but so modified as to enable it to be introduced within the nostrils. With this instrument small pieces of the septum can be successively clipped out until the deflected portion has been removed, after which the parts heal kindly. There is, of course, some contraction of the parts following the operation, which in part

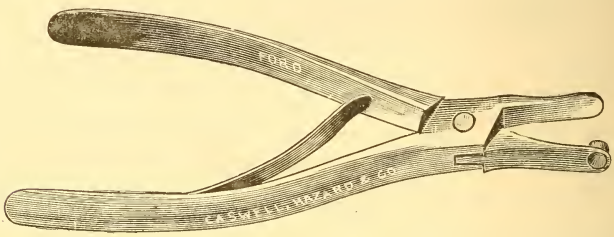

Fig. 111.—Blandin's punch for use in deviation of the septum.

serves to close the opening, but the contraction is in a vertical plane, so that the deformity cannot be re-established. Another plan of cutting away the deflected septum is by a small curved knife, but the punch would seem to afford a preferable means of operating. As preserving the integrity of the parts the operation by the Adams method, however, will perhaps be resorted to rather than the latter plan.

Foreign Bodies in the Nose.

Children in their genius for mischief have a habit of putting small objects into the nose, mouth, and ear, which frequently give rise to serious trouble ; especially is this true in regard to the nasal cavity, in that the orifice is the smallest part, and their removal is far more difficult than their entrance. Moreover, the timid child oftentimes refrains from telling what has happened, and an object which might easily be removed at first, becomes firmly fixed by the swelling of the

mucous membrane excited by its presence. Sometimes foreign bodies get into the nasal passages without the individual being conscious of it at the time, and the immediate symptoms excited by its presence being misunderstood, and soon subsiding, it may remain for years a source of irritation, exciting more or less profuse discharge, which soon becomes purulent in character, and a fetid catarrh is the result. The deduction from this is obvious. In every case of fetid catarrh the nasal cavity should be thoroughly cleansed and examined for the source of the offensive discharge.

In removing foreign bodies from the nasal cavity all violence should be carefully avoided. The object being brought into view, it should be seized gently with forceps and drawn out. A simple device which may be resorted to with children, and which may be mentioned in this connection, is often very efficient. It consists in blowing the child's nose for him as follows: while the head is held steadily between the knees by an assistant, let the operator apply the lips closely over the mouth of the child, and blow forcibly into it. If the child cries, so much the better. The result of this is to drive a current of air behind the palate, and out from the nostril. It is not well to close the other nostril, since there is a possible danger of injury to the ears of the child by too great pressure on the tympanum.

ANOSMIA.

Anosmia or loss of the sense of smell occurs as the result either of conditions in the nasal cavity, which interfere with the function of the olfactory nerve, or from some central lesion in the brain itself.

The sense of smell is dependent on the healthy condition of the mucous membrane of the nose, by which particles of odorous bodies coming in contact with the membrane are dissolved by its mucus, and appreciated by the terminal filaments of the nerves; hence any morbid condition of the mucous membrane of that portion of the nasal cavity to which the olfactory nerve is distributed, which interferes with this process, necessarily impairs or abolishes during its existence the sense of smell. Among the causes that may be enumerated as producing this condition are dry catarrh, ozæna, syphilitic disease,

the presence of tumors, and oftentimes hypertrophic catarrh. The manner in which these diseases give rise to anosmia needs no explanation further than that of mechanical interference with the approach of odorous particles in a state of solution to the terminal filaments of the nerve. The other form of anosmia is that due to morbid conditions of the nerve-trunk, or the olfactory bulb, or still more central lesions. These conditions may be degeneration or atrophy of the nerve, tumors in the nerve or base of the skull, exostoses, caries, meningitis, etc. Other conditions which cause it are blows or injuries, especially blows on the occiput. Occasionally cases are met with of what has been called essential anosmia, in which the loss of smell occurs without any accompanying symptoms or assignable cause; this is apt to occur in young women.

The treatment of anosmia is essentially the treatment of the condition which causes it. If it is due to disease of the nasal cavity, we may say, as a rule, that the removal of the cause promises a restoration of the faculty. Those cases, however, which are of a neurotic origin, usually resist all treatment. The only plan of treatment which promises any hope of recovery is that by the use of electricity. Both the constant and interrupted currents are to be recommended. In connection with this the internal administration of strychnia may be employed.

DISEASES OF THE LARYNX.

CHAPTER XVI.

CATARRHAL AFFECTIONS OF THE LARYNX.

ANATOMY.—The larynx is composed of a cartilaginous framework, containing within it certain muscles, ligaments and fibrous bands, and the whole lined with mucous membrane. The cartilages which enter into its formation are five in number: the epiglottis, thyroid, cricoid, and two arytenoid cartilages. In addition to these there are four small cartilages, or cornicula laryngis: the cartilages of Wrisberg and Santorini, two of each.

Commencing from below, we find resting upon the upper ring of the trachea, the lower cartilage of the larynx, *the cricoid*, consisting of a stout ring rounded in its anterior two-thirds, which gives support to the thyroid; broad and expanded in its posterior third, which gives support to the two arytenoids. It receives its name from its resemblance to a seal ring. Immediately above the cricoid cartilage, and resting upon its anterior portion, is *the thyroid*, composed of two broad quadrilateral plates, which unite at an angle in front, the whole assuming somewhat the shape of a shield, from which it receives its name. At its re-entrant angle below, it affords insertion to the true and false cords, while above is inserted the ligament of the epiglottis.

Surmounting the expanded portion of the cricoid are the two *arytenoid cartilages*, articulating with it by two facets. These are small triangular-shaped cartilages, with their apices turned inward and somewhat forward. The inner surface of each cartilage is smooth, and faces its fellow of the opposite

side; the anterior surface gives attachment to the thyro-arytenoideus muscle and to the ventricular band; the posterior surface affords insertion to the inter-arytenoideus muscle. The base of the cartilage, in its anterior angle, gives attachment to the vocal cord, by means of a small projection which is called the vocal process of the arytenoid. The outer angle of the base of the cartilage is called the muscular process, and affords attachment to the adductor and abductor muscles of the cords.

The epiglottis is a thin plate of cartilage, shaped somewhat like a leaf, and attached at its lower portion by a ligament to the receding angle of the thyroid. It varies very much in shape in different individuals, as shown in Figs. 16—21. In adults it stands up prominently, and projects to a distance above the upper border of the thyroid, while in children its crest rises but little above the laryngeal cavity. It is attached to the thyroid by a freely flexible attachment, which admits of a motion of over 90°, extending from the vertical line to a depression upon the opening of the larynx. This movement is in the main of a passive character, as far as the epiglottis is concerned, although it is to an extent acted on by a few muscular fibres in the ary-epiglottic fold.

The cartilages of Santorini are two small cartilaginous nodules lying upon the apex of the arytenoids. They are endowed with no function and possess no especial points of interest.

The cartilages of Wrisberg are two slender staff-like cartilages found in the ary-epiglottic folds, and are seen as small whitish projections immediately in front of the arytenoids. They serve possibly as a support to the fold of membrane in which they are found.

The cartilages of the larynx form a rigid framework or case, which is simply an expanded portion of the upper air-tract, so arranged as to afford lodgement for the apparatus designed to fulfil certain functions in phonation and respiration. For our present purpose it will be sufficient to describe those parts which are essentially concerned in the performance of these functions. They are the true and false cords and the muscles by which they are acted upon.

The true vocal cords are composed of two firm bands of yellow elastic tissue, which pass from the anterior angle of the

base of the arytenoid cartilage to the receding angle of the thyroid. Above these, and parallel with them, are the *false vocal cords*, or more properly the *ventricular bands*, two bands of fibrous tissue stretching from the anterior surface of the arytenoid cartilages to the receding angle of the thyroid, immediately above the insertion of the true cords. Between the true and false cords is found the *ventricle of the larynx*, an elongated recess which leads up by a narrow opening into a blind pocket called the laryngeal pouch or sacculus laryngis, a membranous sack which contains a large number of small follicular glands, whose function is to secrete mucus for the lubrication of the vocal cords.

The muscles of the larynx are nine in number, one single muscle and four occurring in pairs. The latter are the crico-thyroidei, crico-arytenoidei postici, crico-arytenoidei laterales, and thyro-arytenoidei ; the single muscle is the arytenoideus.

The crico-thyroidei muscles arise from the anterior portion of the cricoid ring and are inserted into the lower and inner border of the thyroid cartilage. Their action is to draw the thyroid cartilage down upon the cricoid, thus increasing the distance between the angle of the thyroid in front and the arytenoid cartilages behind, rendering tense the vocal cords.

The crico-arytenoidei postici muscles arise from the posterior surface of the expanded portion of the cricoid cartilage, passing upward and outward to be inserted into the outer angles of the bases of the arytenoid cartilages. Their function is to rotate the arytenoid cartilages on themselves, throwing their anterior angles, into which are inserted the vocal cords, outward, thus opening the rima glottidis.

The crico-arytenoidei laterales muscles arise from the inner face and upper border of the side of the cricoid cartilage, and passing upward and backward are inserted into the outer angles of the bases of the arytenoid cartilages. Their action is directly antagonistic of the crico-arytenoidei postici muscles in drawing the outer angle of the cartilage forward, thus rotating its anterior angle, into which is inserted the vocal cord inward, closing the rima glottidis.

The thyro-arytenoidei muscles arise from the receding angle of the thyroid cartilage, and are inserted into the anterior surfaces of the arytenoid cartilages lying parallel and in contact with the outer border of the true cords. The function of these

muscles has never been clearly determined. They are often spoken of as the relaxors of the vocal cords, in that they draw the arytenoids toward the thyroids. It is difficult to understand what possible end could be accomplished by such an action. Relaxation of the cords is a purely negative action, or rather, perhaps, passive in character; it is accomplished without direct muscular contraction, but simply by a "letting go" of the muscles. Tension of the cords, on the other hand, is of the utmost importance in the nicer modulations of the voice, and can only be accomplished by direct muscular contraction. The existence of such a function in the muscular structure of the larynx is, of course, not questioned. If it does not lie in these muscles it lies in the crico-thyroidei, but a little consideration of their position and character will show that they are scarcely capable of acting on the vocal cords to give them that delicacy of tension which they possess for the regulation of the pitch of the voice.

The thyro-arytenoideus muscle is attached to the under-surface of the vocal cord throughout its whole extent, and the cord may, with propriety, be regarded as a tendon of the muscle. Its action as a tensor can be best illustrated by the familiar example of a rope stretched between two fixed points; if it is moistened, its fibres absorbing the water, become swollen, and in distending laterally shorten longitudinally, thus rendering the rope more tense.

The arytenoideus is a single muscle passing from the posterior surface of one arytenoid cartilage, to the corresponding surface of the other, and consists of transverse and oblique fibres. The transverse fibres pass directly across from one cartilage to the other, while the oblique fibres pass from the apex of one cartilage to the base of the other. The action of the arytenoideus muscle is to complete the closure of the rima glottidis by drawing together the cartilages. The necessity of this action will be seen by reference to Fig. 134, for while the action of the crico-arytenoideus lateralis is to approximate the vocal cords, the closure of the rima is not completed. By the action of this muscle the vocal processes of the arytenoids are brought into apposition, closing the glottis from that point to the thyroid cartilage, but a triangular space is still left between the vocal process and the arytenoid commissure which is only closed by the action of the arytenoideus muscle. In

addition to these nine intrinsic muscles we have three small pairs of muscles belonging to the epiglottis. They are the thyro-epiglottideus, the aryteno-epiglottideus superior, and the aryteno-epiglottideus inferior.

The thyro-epiglottideus is a small muscle which arises from the inner surface of the thyroid cartilage near its receding angle and extends to the margin of the epiglottis. Its action is to depress the epiglottis. A few of its fibres are spread out upon the outer surface of the sacculus laryngis, while others are lost in the ary-epiglottic fold.

The aryteno-epiglottideus superior muscle consists of a few muscular fibres which, having their origin at the apex of the arytenoid cartilage, pass forward and are lost in the ary-epiglottic fold. The action of this muscle is to close the superior aperture of the larynx, and is especially brought into use in supplying the place of the epiglottis, when that cartilage has been destroyed, in preventing the entrance of food into the larynx during the act of deglutition.

The arytenoideus epiglottideus inferior arises from the anterior angle of the arytenoid cartilage and is spread out upon the sacculus laryngis, and is also inserted into the margin of the epiglottis. Its action is the same as the last mentioned muscle, with the addition that it acts to compress the sacculus laryngis.

The mucous membrane lining the larynx is covered with columnar ciliated epithelium in that portion which is below the border of the ventricular bands and also on the lower half of the epiglottis. The remaining portion of the membrane is covered with pavement epithelium. It is richly endowed with glands in all portions except on the true vocal cords. These glands are especially grouped in the arytenoid commissure and upon the epiglottis.

The nerves of the larynx are the superior laryngeal and recurrent laryngeal, both branches of the pneumogastric nerve. The superior laryngeal nerve supplies sensibility to the mucous membrane of the laryngeal cavity, and motion to the cricothyroid muscle, and probably to the thyro-epiglottideus and the two aryteno-epiglottidei muscles. The recurrent laryngeal nerve is mainly the nerve of motion and supplies all the other muscles of the larynx.

PHYSIOLOGY.—The larynx is of interest to us in the per-

formance of three functions, viz., in deglutition, respiration, and in the production of the voice.

In the act of *deglutition* after the bolus of food has passed the isthmus of the fauces, the larynx, together with the pharynx, is drawn up by certain muscles acting through the hyoid bone, and at the same time drawn under the base of the tongue. By this movement the epiglottis falls over the superior opening of the larynx, which is thus protected from the entrance of food. That the epiglottis is not absolutely essential in protecting the larynx in the act of swallowing has been repeatedly demonstrated, both in man and the lower animals, the act being usually accomplished after the total ablation of this cartilage, without necessarily endangering the air-passages. The entrance of the food into the larynx is prevented in these cases by the contraction of the aryteno-epiglottideus muscles, and also by the contraction of other muscles involved in the act, which press together the thyroid cartilages.

In *respiration* the chink of the glottis is opened for the entrance of air, by the action of the crico-arytenoidei postici muscles, while in expiration the muscles of the larynx are simply relaxed, the current passing from the lungs being sufficient to force open the glottis, as it were. This function of the larynx is carried on by means of the single pair of muscles above mentioned, which thus become among the most important muscles of the body, for the reason, that in the absence of this glottis opening function the vocal cords fall toward the median line under the action of the glottis closers; the chink of the glottis becomes thus closed, and the breathing is either arrested or much hindered, giving rise to a most serious condition.

The remaining function of the larynx is in the *production of the voice*, which is formed by vibrations of the vocal cords, the larynx being regarded essentially as a reed instrument. The method by which the voice is formed, and its pitch and volume regulated, is extremely simple. The vocal cord proper is composed of dense fibrous tissue, covered by a very thin layer of mucous membrane, and is easily thrown into vibrations by a current of air forced through the chink between the two cords, which are kept at a certain tension, and also in apposition by muscular action, the essential requirements for the production of a clear tone being that the cords shall be healthy, as regards conformation, and that muscular action by

which they are approximated and made tense shall be normally performed. The muscles by which the cords are approximated are the crico-arytenoidei laterales. The tension of the cords is accomplished by the crico-thyroidei, and the thyro-arytenoidei, with the aid of the crico-arytenoidei postici muscles, which by their contraction hold the arytenoid cartilages in a fixed position. The special method of voice production is as follows: the air having been drawn into the lungs, the cords are approximated by the action of the crico-arytenoidei laterales and the arytenoidei muscles, and made tense by the thyro-arytenoidei and crico-thyroidei. By the contraction of the pectoral muscles the air is now driven with considerable force through the narrow chink thus formed between the cords, which are thereby thrown into vibration, these vibrations setting in play vibrations in the column of air filling the nasal and oral cavities. The volume of the sound is dependent mainly on the force with which the air is driven through the rima glottidis, while the pitch is regulated by the tension of the cords. By this process the voice alone is formed, while articulation of the voice into language is accomplished by means of the soft palate, uvula, lips, and tongue.

Before entering upon the consideration of special affections, it should be stated that there are certain morbid conditions of the larynx which are occasionally treated of as independent disorders. These are, anæmia, hyperæmia, anæsthesia, and hyperæsthesia of the larynx. They are to be regarded as symptoms merely, and not distinct diseases, hence they will only receive consideration in so far as they accompany other affections.

Subacute Laryngitis.

This is an inflammation of the mucous membrane lining the laryngeal cavity, acute in character, but of a mild type. It sets in somewhat suddenly, involves no especial danger, is attended with no alarming or painful symptoms, runs a limited course, and usually undergoes resolution in from five to eight days. The inflammatory action is confined mainly to the mucous membrane proper, and does not involve the submucous tissues. In this lies the distinction between subacute and acute laryngitis, for the essential gravity and danger of the lat-

ter affection is due to the fact that the morbid process involves the submucous cellular structures, giving rise to an amount of tumefaction or œdema which does not exist in the milder disorder. It is the result, in the large majority of instances, of exposure to cold, and in many cases we notice that it occurs from a very slight exposure. This is probably due to an already existing laryngeal catarrh, the result of a neglected cold, which subsiding, has left behind it a very moderate inflammation of the mucous lining, which gives rise to symptoms of so trivial a character as to render it a source of no inconvenience, more than a liability to take cold easily.

The inhalation of irritating vapors or gases, or the breathing of an atmosphere vitiated by dust or tobacco-smoke, may give rise to the affection, as may also the prolonged use or overstraining of the voice in public speaking or singing. Especially is this the case if the organ is already the seat of a mild chronic catarrh.

The damp and chilly atmosphere which prevails during the Spring and Fall months is a prolific cause of attacks of subacute laryngitis, which may be said to prevail almost endemically at this time, while the clear cold of midwinter, as well as the heat of summer, afford a certain degree of immunity from the attacks. In the very large majority of instances this affection occurs in those suffering from a chronic laryngitis, and consists in an acute exacerbation of the chronic disorder, as the result of an exposure to cold. This latter affection, as has been already shown, is one of the very frequent sequela of nasal catarrh, hence a subacute laryngitis occurs in most cases in those suffering from the nasal disorder. Furthermore, a liability to the occurrence of repeated attacks should suggest the probability of a morbid condition in the nasal cavity.

Symptoms.—The prominent symptoms of the disease are a slight sense of irritation or tickling in the fauces, accompanied by a disposition to cough and clear the throat of the moderate accumulation of mucus which is secreted, together with more or less impairment of the voice, or complete aphonia. The degree and extent of the inflammatory process is limited, hence the amount of abnormal secretion is quite small. It consists of a thin muco-purulent discharge which is hawked or coughed up and voided, with but a partial sense of relief, as the congestion of the parts gives rise to a thick, swollen feeling in the throat which cannot be gotten rid of.

The voice is either impaired or lost according to the severity of the attack. This impairment of the voice shows itself in hoarseness or marked lowering of its register, the cords being thickened by the congestion of the mucous membrane covering them, and not admitting of the fine vibrations which produce the higher notes. Occasionally the voice is entirely lost, being reduced to a mere whisper. This is, of course, not a serious symptom, and yet the gravity which attaches in the minds of the laity to aphonia, and the apprehension with which it is regarded, is often very great, although in subacute laryngitis it is a somewhat trivial symptom, and, to an extent, adventitious. It is not entirely due to thickening of the vocal cords, but rather to an infiltration of the mucous membrane covering the arytenoid commissure, which prevents their proper approximation. In addition to this it is probable that the muscular structures of the larynx are somewhat weakened by the morbid process in the membrane covering them. They become somewhat congested, and, possibly, the seat of a moderate degree of serous infiltration, which necessarily offers a mechanical obstruction to their contraction. They do not respond readily to the nerve-current, hence adduction and tension of the cords is imperfectly accomplished, and an additional source of aphonia is present. The voice is reduced to a whisper, that is, the glottis is closed to the extent of producing a rushing sound in the current of expired air, but is not closed sufficiently to throw the cords into vibration, and this rushing sound is formed into articulate language by the lips, tongue, etc., in the same manner as the clear voice, producing the whispered voice. The complete aphonia does not always indicate that the attack is a severe one, as this symptom may occur in a mild attack, but rather that the arytenoid commissure is the seat of a more than usual congestion, or that the muscular structures are much weakened by the inflammatory process.

In the milder cases the subjective symptoms are not very prominent, but in the severer cases there is occasionally considerable pain, referable to the region of the larynx, of a burning or smarting character, with more or less discomfort in swallowing and tenderness on external pressure. In these cases, also, cough is usually present, and often of an extremely irritating and persistent nature. It commences with a mere tickling in the throat which soon excites a cough, of a harsh, dry charac-

ter, the secretion being somewhat scanty. Not infrequently there is a sense of oppression referable to the chest region, and especially marked under the sternum. In these cases the cough becomes somewhat prominent, and quite persistent. The throat also becomes quite irritable, and the cough is excited by trivial causes, such as laughing, the drawing of a deep inspiration, etc. These symptoms, generally, are to be accounted for by the fact that the morbid process extends somewhat below the larynx and into the trachea.

As the attack progresses, the secretion becomes somewhat increased in amount, and assumes a yellowish color, and something of a muco-purulent character. The voice, also, if lost at the onset of the attack, is to an extent regained, yet still has a hoarse and a somewhat metallic resonance. This change in the character of the voice ensues as the secretion of the membrane becomes re-established, and the marked congestion which characterizes the first stage of the inflammation subsides, and there sets in the second or secreting stage. Fever is not usually present to any marked degree, but there is often a feeling of general malaise, with irregular, fleeting, muscular pains, and loss of appetite.

Examination.—If now we inspect the parts there will be seen, in the milder cases, a diffuse redness of the mucous membrane lining the larynx, especially of that portion covering the arytenoid cartilages and commissure, and also the ventricular bands. There is no marked swelling of the parts, however, and the cavity is in no degree encroached upon. The membrane covering the vocal cords also presents the same reddened and congested appearance.

In the severer cases the membrane presents a somewhat deeper injection, with a moderate but evenly diffused swelling of the portion covering the ventricular bands. This may be present to the extent, that the bands project over and partially conceal the true cords.

The diagnosis is comparatively simple. There is no other affection which presents the same uniformly diffuse congestion of the lining membrane of the larynx, and involving the vocal cords, except acute laryngitis. The differential diagnosis is of importance, in that this latter affection, while an extremely rare one, is one of exceeding gravity, and the measures which must be resorted to for arresting its progress need to be of a very ac-

tive character. The prominent differences between the two diseases are in the amount of swelling, and in the character of the discoloration of the membrane. In the graver affection the swelling is quite prominent, the lumen of the larynx being markedly encroached upon, which is not the case in the subacute form of the disease. And again, the membrane in the milder form is of an opaque reddened color, while in the graver affection it presents a humid, semi-translucent œdematous appearance, especially marked over the arytenoids, ary-epiglottic folds, and the epiglottis. In addition to this, the symptoms are of a more alarming character in the dyspnœa, pain, fever, etc., which accompany acute laryngitis.

Treatment.—While the disease is to an extent a self-limited one, it is doubtful if the laryngeal lining, after an attack which is allowed to run its course without treatment, reverts to an entirely healthy condition. This would suggest certain simple general measures in the way of prophylaxis ; this has already been alluded to, however, under the general subject of taking cold, in the chapter on that subject. Among the first and more important directions to be insisted upon, when an attack occurs, is that of absolute rest of the larynx. The influence of the unrestricted use of the voice in aggravating an attack of laryngeal catarrh is much underestimated. An ordinary conversation carried on by means of a larynx whose function is impaired by a simple catarrh, requires an additional effort to bring the muscles into play and the cords to a sufficient tension for vocalization ; in singing, or loud talking, this effort is necessarily much greater, rendering necessary a straining of the voice which cannot but have a deleterious influence on an existing inflammation ; hence this simple precaution cannot be too urgently insisted upon as of importance in limiting an existing attack and avoiding the danger of its lapsing into a chronic inflammation of the laryngeal membrane. General remedies for the correction of the fever and malaise are necessary according to the severity of these symptoms, but, as a rule, are not prominently indicated.

There are certain remedies whose internal administration has already been alluded to as exercising a controlling effect on inflammations of the upper air-passages. These are ammonia and cubebs. In a simple, mild attack, attended with no marked general symptoms, the administration of these reme-

dies will be sufficient, in connection with certain general directions as regards rest of the voice, proper protection, avoidance of fresh cold, together with a few days' confinement to the house. These may be given as follows:

℞. Ammonia carbonat..... ʒ ij.
Elixir simpl..... ℥ iij.
M. Sig.—One teaspoonful every four hours.

℞. Fl. ext. cubebæ..... ℥ ss.
Syr. aurant cort..... ℥ j.
Aquæ..... ad. ℥ iij.
M. Sig.—One teaspoonful every four hours.

℞. Pulv. cubebæ..... ʒ ss.
Sacch alb..... ʒ j.
M. Ft. pulv., in chart. No. vi. div. Sig.—One powder every two hours.

Occasionally these may be combined as follows:

℞. Fl. ext. cubebæ,
Ammonia carbonat..... āā ʒ ijss.
Elixir simpl..... ad. ℥ iij.
M. Sig.—One teaspoonful every four hours.

℞. Pulv. cubebæ,
Mur. ammonia..... āā ʒ ss.
Sacch. alb..... ʒ ij.
M. Ft. pulv., in chart. No. x. div. Sig.—One powder every two hours.

If there is much cough an anodyne may be combined with the above remedies as follows:

℞. Fl. ext. cubebæ..... ℥ ss.
Tr. hyoscyami,
Syr. tolutani,
Aquæ..... āā ℥ j.
M. Sig.—One teaspoonful every four hours.

℞. Ammonia muriat..... ʒ ij.
Codeiæ..... gr. iij.
Elixir simpl..... ℥ iij.
M. Sig.—One teaspoonful every four hours.

If the attack is a severe one, in addition to the administration of the above, local applications should be resorted to. Without repeating what has already been said in regard to applications to the larynx, it is sufficient to state that in acute affections exceeding care should be exercised to use no irritating application, and only to use such methods of making applications as are easily tolerated. Brushes, sponges, and probangs carried into the larynx, unquestionably aggravate an existing acute inflammation and should be avoided. The laryngeal atomizer carries the fluid into the cavity and directly upon the inflamed membrane, in a manner which is the least objectionable of any method we possess, and, wherever feasible, should be resorted to. Sass' tubes with compressed air, Fig. 62, afford the best means that we possess. Failing these, some of the other devices may be resorted to. The fluids to be recommended are as follows: Glycerole of tannin, ʒ j.— ℥ j., potass. chlorat., gr. x.— ℥ j., zinci sulph., gr. iv.— ℥ j., sodæ biborat., gr. x.— ℥ j., aluminis sulph., gr. vi.— ℥ j.

If there is much congestion of the parts a more decided astringent than any of the above may be used as follows: Liq. ferri. persulph, gr. x.— ℥ j., ferric alum, gr. vi.— ℥ j.

If the larynx is irritable, and the seat of much localized pain either on swallowing or on pressure, morphine may be added to any of the above prescriptions, of the strength of ten grains to the ounce.

These applications should be made at least once each day, care being taken during the application not to weary the patient or irritate the larynx to too great an extent. The beak of the atomizer should be passed into the pharynx, its tip in such a position, beyond the crest of the epiglottis, that when the pressure is let on the jet will flood the laryngeal cavity before reflex contraction can occur. It should be allowed to play but an instant, when it should be withdrawn and the patient permitted to rest. This procedure may be repeated two or three times, when all will have been accomplished that is necessary or feasible. Occasionally it will be best, before making the astringent applications, to cleanse the larynx by the use of one of the cleansing solutions given in the Appendix, thrown into the cavity under the directions just given.

Powders are neither well borne in acute inflammations of the

laryngeal cavity, nor are they of service. In the absence of a laryngeal spray it is doubtful if it is well to attempt local medication, as there is danger of doing quite as much harm as good by the introduction of the sponge or brush.

Inhalations are much used in the acute inflammation of the laryngeal membrane, and are of unquestioned benefit. It is also an advantage that they can be managed by the patient at his own home. Any of the astringent remedies already mentioned may be used by means of the steam atomizer, Fig. 66, under the same rules which would govern the choice of an agent for direct application by means of the spray-tubes.

Another form of inhalation consists in making use of certain remedies which are volatilized by hot water. Among the best of these for use in subacute laryngitis are, tinct. benzoin co., and tinct. lupulin. A teaspoonful of the drug is to be put into a cup of hot water at a temperature of 120°, and the cup held under the mouth, and its vapor inhaled as long as any of the volatile principle is given off. A few drops of ol. picis, creosote, or carbolic acid, may be added occasionally, with benefit. If there is pain or soreness, opium or hyoscyami may be combined with the astringent. The more elaborate device for inhalation, shown in Fig. 67, may be used, but this is not essential to the efficacy of the remedy. Other remedies for use by inhalation are given in the Appendix.

A physician's aid is often sought by public speakers or singers, who have contracted a subacute laryngitis a few hours or a day before they are under obligation to give an address or sing in public, and he is called upon to restore the voice at a few hours' notice, even if it is only a temporary one. If the request could be complied with, the temporary relief would be followed by a marked aggravation of the morbid condition, if the voice were subjected to the great strain which its use while enfeebled would require. But the request cannot be complied with, and I know of no remedy which will accomplish the desired result. The drugs which are said to afford this rapid relief are belladonna and aconite. The action of these agents on the fauces is familiar to all in producing an abnormal dryness, etc. They have an undoubted influence on the vocal cords also. An individual suffering from an acute laryngeal catarrh, with impaired or lost voice, if he will confine himself to the house for the day and give his voice absolute rest,

and at the same time take one or two drops each of tr. belladonna and tr. aconite rad., every hour for three or four hours before he desires to make use of the voice, will not infrequently notice a marked improvement, and even be able to subject it to a moderate effort. More frequently, however, the experiment will fail. Other than the above, I know of no plan of procedure which will accomplish the desired end; and even in this plan I regard the rest and confinement to the house as the more active agents for good. The value of absolute rest to the vocal organ, in an acute inflammatory attack, cannot be overestimated. If to this there be added confinement to the house and an equable temperature, it will be found, not infrequently, that the affection will disappear in but a short time.

If, on the other hand, one suffering from one of these attacks subjects the organ to ordinary usage even, and also goes about in the open air, the mere effect of the chilly and possibly damp atmosphere may serve to prolong and aggravate what might have been a comparatively trivial attack; and also to prevent a complete resolution. The attack subsiding, there will probably ensue a chronic laryngeal catarrh.

Acute Laryngitis.

This is an acute inflammation of the mucous membrane lining the laryngeal cavity, which, while of comparatively rare occurrence, is one of an exceedingly grave and serious import, in that the grade of the morbid process is of an extremely active character, and that the deeper tissues of the membrane are involved. In the 8,000 cases treated at the Bellevue Throat Clinic in the past four years, there have presented but two cases of this disease occurring idiopathically. Of course it is not to be anticipated that one suffering from a disease of so serious a character will present at a clinic for out-patients, still this fairly represents the extreme rarity of the disease. This fact is urged somewhat because we hear so frequently an ordinary subacute laryngitis spoken of as an acute attack. The distinction should always be made between the two diseases.

The morbid process in acute laryngitis assumes a somewhat phlegmonous character, being attended by a considerable degree of swelling of the membrane, due in part to a certain

amount of serous infiltration, the result of the activity of the inflammatory action.

The onset of the attack is usually quite sudden, being ushered in by a decided chill or by mere chilly sensations, followed by general febrile motion, manifesting itself in the hot and flushed skin, rapid pulse, pains in the muscles, headache, etc., the temperature rising to 102°—104°. Following soon upon the febrile movement, there is a sense of burning and smarting referable to the region of the larynx, together with pain and tenderness on external pressure. Swallowing soon becomes difficult and painful, on account of the lack of flexibility of the muscles of the fauces, and the pressure to which that act subjects the swollen and sensitive organ. Cough of a dry, irritating character soon sets in, together with hoarseness, or more commonly complete loss of voice. Dyspnœa, dependent on the amount of œdema of the membrane, comes on quite early in the course of the attack, and may become of a very alarming character.

The disease generally arises from an exposure to cold, but what other causes may operate as predisposing to, or as directly producing an attack of acute laryngitis, as the result of a cold, rather than a chronic inflammation of the membrane, it is difficult to say. That children are more frequently attacked than adults is explained by the fact that in them the mucous membrane is very loosely attached to the parts beneath, and is eminently adapted to admit of serous exudations in its loose submucous cellular tissue, while in adult life the mucous membrane is quite closely adherent to the parts beneath, and there is a less amount of the deep cellular tissue. It occurs in apparent good health, and progresses rapidly, the exceeding activity of the morbid process being manifested from the very onset of the disease. It is still a purely catarrhal inflammation, that is, an inflammation not characterized by any fibrinous exudation, but one in which the morbid process is so active and the blood-vessels so distended that very early in its progress serum is poured out from the engorged vessels, and infiltrates the tissue to the extent of producing mechanical obstruction to respiration, in that narrowest portion of the respiratory tract where a comparatively small obstruction may lead to grave results. A certain historical interest attaches to this disease, from the fact that George Washington died from an at-

tack lasting but twenty-four hours. It runs a rapid course of from five to seven days, tending to resolution at the end of that time, although there is danger of a fatal termination earlier in the course of the disease. The mode of death is by suffocation, resulting purely from the laryngeal obstruction. This is not due usually to the inflammatory swelling, but to a secondary œdema which is liable to set in at any time.

Diagnosis.—This is of importance in the early stages of the attack, as giving warning of its dangers and indicating the special measures to be resorted to for warding them off. A laryngoscopic examination, therefore, is of the utmost value in revealing the exact condition of the parts. There will be found the following appearances: the mucous membrane lining the larynx of a fiery red color throughout the whole cavity, presenting all the appearances of an active acute œdematous inflammation, the color being due to engorgement of the blood-vessels. The membrane is also markedly swollen, the swelling being especially prominent in those portions where its attachments are loose, and where there would naturally be room in the submucous cellular tissue for exudation. This is found in the ary-epiglottic folds and on the posterior face of the epiglottis, and to a less extent in the mucous membrane covering the arytenoid cartilages and the inter-arytenoid commissure. If the case is a severe one the swelling will be very great, and the red color of the arterial congestion will be masked to an extent by an œdematous exudation, as shown by a humid and watery appearance of the membrane, giving it a semi-translucent aspect. The swelling may be so great as to seriously obstruct respiration, due partially to the inflammatory infiltration and partially to the œdema resulting from it.

Treatment.—The treatment must be prompt and vigorous from the very onset of the disease, as its progress is so rapid and the grave symptoms set in so quickly that they should be combated by every measure at our disposal. The patient should be kept in a warm room, at a temperature of 75° or 80°, and which is highly surcharged with the vapor of steam. This is easily accomplished by keeping a pot of water boiling in the room on a stove or over a spirit-lamp. In addition to this, local applications should be made directly to the inflamed membrane. This should be done by means of the laryngeal spray, in preference to the brush or sponge introduced into

the larynx. The solution to be used should possess decided astringent and anodyne properties, and be free from any irritating qualities. To meet these requirements one of the following may be used in the order of preference.

℞. Ferri et aluminis sulphat..... gr. vi.
Morphia sulphat..... gr. x.
Aquæ..... ℥ j.
M. Ft. lotio.

℞. Plumbi acetat..... gr. iij.
Aq. ext. opii..... gr. xx.
Aquæ..... ℥ j.
M. Ft. lotio.

℞. Aq. ext. opii... ..... gr. xx.
Glycerinæ tannat..... ℥ j.
Aquæ..... .. ..ad. ℥ j.
M. Ft. lotio.

These applications should be repeated every three or four hours, if necessary, until the graver symptoms have subsided.

Inhalations of medicated vapors are, to an extent, of value during the intervals of treatment at the hand of the physician. The remedies that may be used in this manner are: ol. resin lupulin, tr. benzoin co., aq. ext. opii, and ext. hyoscyami, by the methods suggested on p. 68.

A better method, however, than the vapor inhalations is the steam atomizer shown in Fig. 66. This instrument, as has been before remarked, is of somewhat limited value in the treatment of chronic catarrhal affections; in acute laryngitis, however, its efficiency is undoubtedly marked. In directing its use in this affection, care should be exercised in its management, lest by its prolonged use harm may ensue. The inhalations should never be continued longer than three minutes, the mouth being held close to the aperture of the globe and the vapor taken by ordinary respiration and not by labored effort. The remedies which will prove efficient are as follows: tannin, gr. v.—℥ j., infus. rhatany, infus. quercus alba, decoct. papaveri, etc. Alcoholic tinctures, as a rule, should be avoided as too irritating.

The object of treatment in acute laryngitis is not to abort the attack, but to promote resolution by hastening the progress of the different stages of the inflammatory process and to limit the graver features of the disease. The hot steam facilitates the progress of the affection in relaxing the parts and promoting secretion, by which the swelling is reduced.

The mild astringents which are used in connection with the hot steam have a tendency to reduce the congestion by constricting the blood-vessels, and so limit the amount of serous exudation and cut short the duration of the attack. In addition to these local remedies, counter-irritants may be found of value. A small fly-blister, of three-quarters of an inch in diameter, should be applied over each wing of the thyroid cartilage.

Hot fomentations, however, and poultices should be avoided, as also any bundling or muffling of the neck. Internal medication, as a rule, is not indicated, the disease being a local inflammatory affection, whose gravity depends, not on the extent of the constitutional symptoms, but on the importance of the function of the part involved. Some benefit, however, may be counted upon in the administration of aconite in small doses, frequently repeated. Fleming's tincture may be given in doses, from one to two minims, every two hours. With this there may be combined the sesquicarbonate of ammonia, from three to five grains. The administration of the tincture of iron, also, is undoubtedly of advantage, and may be given in alternation with the aconite and ammonia, in doses of from five to ten minims, administered in solution with glycerine as follows:

℞. Tinct. ferri..... ʒ jss.—ʒ ijss.
Glycerinæ.....ad. ℥ ij.
M.

Œdema of the larynx is one of the prominent tendencies in acute laryngitis, and the one which will give rise to the greatest danger; this will be considered in the section on that disease.

Chronic Catarrhal Laryngitis.

This form of laryngitis is a catarrhal inflammation of the mucous membrane lining the larynx, of a mild type and chronic character, the main importance of which lies in its interfer-

ence with the nicer functions of the larynx in phonation ; and the moderate amount of annoyance due to the abnormal secretion from the membrane. It is due, not infrequently, to repeated attacks of a subacute nature, which undergoing imperfect resolution, leave behind a permanent morbid condition of the parts. In most cases, however, the affection is chronic from the commencement. In these cases it is due, generally, to a pharyngeal or nasal catarrh. The influence of these affections in producing laryngitis has not generally been recognized sufficiently, but their influence is unquestioned in this direction. It may be stated almost as a rule without exception, that in all cases of chronic nasal catarrh of long standing, where there is hypertrophy of the glands at the vault of the pharynx, or marked thickening of the nasal membrane, that an examination of the laryngeal cavity will show it to be in a state of chronic inflammation. The method of its production is quite simple. The secretion from above, passing down the walls of the pharynx, falls directly upon the arytenoid commissure, and so makes its way into the laryngeal cavity. The long-continued and persistent action of this constant dropping in the throat, cannot but have an influence on the larynx which eventually leads to a chronic inflammation of its lining membrane. In addition to this there is an unquestionable tendency, in a chronic catarrhal inflammation in the upper air-passages, to invade neighboring parts, from which the larynx is certainly not exempt.

Furthermore, if a moderate catarrh of the larynx be established as the result of a nasal catarrh, it becomes subject to the aggravating influences already alluded to in connection with pharyngeal catarrh, which the existence of a morbid condition of the nares necessarily entails upon the upper air-passages. Normal nasal respiration being impeded, respiration is carried on through the mouth, and thus the air-passages are traversed by a current of dry, cold, and impure air, which serves to aggravate any existing morbid condition.

This matter of the dependence of a laryngeal catarrh on a nasal catarrh, I desire to assert with especial emphasis, for I believe it to be one which can be easily verified. In a somewhat large experience, in dealing with these often intractable cases, I have repeatedly had this point impressed upon me, both by my failure to relieve the laryngeal trouble by confin-

ing measures of treatment to that organ alone, and again by the successful relief of the chronic laryngitis in at the same time directing treatment to the nasal disorder.

Among other and common causes of a chronic laryngitis may be noticed, chronic catarrhal and follicular pharyngitis, chronic elongation of the uvula, and hypertrophied tonsils. The influence of these affections in developing the disease of the larynx is easily understood, their influence being analogous to that of nasal catarrh. Chronic pulmonary affections, whether of a simple catarrhal or of a phthisical nature, are generally accompanied by a laryngeal catarrh. This is easily explained by the irritation to which the larynx is subjected in the constant cough which accompanies those affections, together with the discharges passing over it from below.

Straining the voice is a not infrequent cause of laryngeal catarrh. This may occur in prolonged use of the voice; in the attempt to give it a force or volume which it does not possess; and in false singing. This latter vice consists oftentimes in carrying the notes beyond the normal register which belongs to any individual voice; and also in changing from one register to another without altering the position of the larynx. The position in which the larynx lies in the neck in singing the chest-notes for instance is quite low, while when the head-notes are taken the larynx is raised and brought forward somewhat, while the plane of the cords is altered. It will be easily understood, then, if notes which belong to the head-register are attempted while the larynx is in the position for taking the chest-notes, that the action is only accomplished with a degree of effort which is almost painful. The result is that the voice is strained. It is a rule which is familiar to all, that a singer should never strike a note which cannot be taken with perfect ease and facility, and without labored effort.

It is probable that what we call straining the voice consists in the rupture of some of the fibres of the tensor muscle, accompanied possibly by the rupture of some of the smaller blood-vessels. The result of this accident is to cause a mild subacute laryngeal catarrh, which soon subsides, leaving behind it a chronic catarrhal laryngitis. It is probable, furthermore, that in many of these cases the larynx is already weakened by a mild morbid condition resulting from a nasal catarrh. This affection oftentimes exists without being recognized in patients

who having little cause to use the voice in singing or prolonged talking are unconscious of the presence of any trouble in the larynx, more than the slightly abnormal secretion, the laryngeal catarrh being overlooked in the more annoying nasal catarrh.

Symptoms.—The symptoms of a chronic laryngeal catarrh are not ordinarily prominent. There is a more or less excess of secretion, with a disposition to clear the throat, and an occasional huskiness of the voice, with oftentimes a tickling irritating cough, which is quite prominent in the damp days of Spring and Fall, but generally absent in the winter and summer months. The prominent feature, however, of the disease is in its influence on the voice, and to those whose occupation requires the use of this organ, either in singing or public speaking, the existence of a chronic catarrh of the larynx becomes a matter of considerable gravity. There is congestion of the mucous membrane, with more or less thickening, which extends to the true cords. Their size is increased, and as a natural result their nicer vibrations are in a degree interfered with; the muscular apparatus of the larynx is also weakened to a certain extent; there is loss of muscular control. This is especially marked in the tensors, the thyro-arytenoid muscles, which become relaxed, giving rise to that condition which is sometimes spoken of as elliptical paralysis of the cords. The result of this increased size of the vocal cords, together with the lack of proper muscular power to make them tense, is obvious; the production of the higher notes becomes impossible from lack of tension and the whole voice register is lowered. This, in moderate talking and limited use of the voice, is not especially noticeable, but if prolonged use of the voice is attempted the patient soon becomes conscious of the excessive muscular effort required, and the voice tires. Furthermore, as a result of this increased effort, this straining of the voice, the cords become congested and the voice rapidly husky or completely aphonic.

In addition to the weakness of the voice there is a slightly irritant condition of the larynx, an occasional tickling in the throat, and disposition to cough, the cough being dry, and somewhat stridulous in character, preceded generally by the irritation in the fauces, with a disposition to clear the throat. This is oftentimes more troublesome at night than in the day-

time. There is also an especial liability to recurrent attacks of subacute laryngitis, with more or less complete loss of voice.

Examination.—An inspection of the larynx reveals the whole mucous membrane lining the organ congested, and of a deep red color, verging on a purplish hue, the redness being more marked over the false cords and arytenoids. The normal pink tint of the healthy mucous membrane is almost entirely lost in this deeper red color. The parts present a somewhat opaque appearance, the yellow tinge of the cartilages, which is seen through the healthy membrane, is lost, their color being concealed by the thickened and congested membrane. The commissure of the arytenoids presents a thickened, puffy appearance often, with a tendency to a pouching anteriorly between the arytenoid cartilages, and overhangs somewhat the posterior insertion of the true cords.

This thickened condition of the commissure may cause a mechanical interference with the proper approximation of the cords, thus adding to the loss or impairment of voice. The ventricular bands or false cords occasionally will be seen swollen to the extent that they project over the true cords and partially conceal them. The true cords themselves, owing to the delicacy of the mucous membrane which covers them, the absence of any glandular structures in it, and the limited supply of blood-vessels, show in place of a reddened and congested appearance a grayish, ashy discoloration. They are usually covered by a very moderate amount of thick, tenacious mucus, but occasionally have the appearance of cleanliness.

On phonation there will be usually noticed a lack of perfect parallelism during the act, indicating that the tension of the cords is imperfect; they bow out, leaving an elliptical-shaped opening between them. This may be more marked on one side than on the other. In extreme cases this relaxed condition of the cords, as already mentioned, has been called paralysis of tension, or elliptical paralysis of the cords, and is usually described under the head of neuroses of the larynx. That this disease is of nervous origin is open to question, or that it constitutes a separate and distinct disease. I have never seen a case of so-called elliptical paralysis which was not attended with chronic laryngeal catarrh, and rarely a case of chronic laryngeal catarrh which was not attended with some degree of impairment of the tension of the cords. As has been

before stated the chronic catarrhal inflammation of the membrane lining the larynx gives rise to a morbid condition in the muscles lying beneath it, not perhaps to a condition of inflammation of the muscular tissue, but yet to a moderate degree of infiltration which interferes with its proper function. This is especially true of the thyro-arytenoid which lies immediately beneath the mucous membrane and in close contact with the vocal cords.

Treatment.—It is of the utmost importance, in the treatment of this affection, that we should recognize the existence of the cause of the affection and remove it. As above stated, a large proportion of cases are due to nasal catarrh. This may be overlooked while attention is directed entirely to the larynx; hence, both by physical examination and by question eliciting the subjective symptoms, a nasal catarrh, if present, should be discovered and removed by proper remedies.

The same may be said of pharyngeal catarrh, enlarged tonsils, elongated uvula, etc. All remedies directed to the removal of the morbid condition within the larynx are of little avail as long as an exciting or aggravating cause exists to perpetuate the trouble. As regards the habit of smoking, the same is true here, as in regard to pharyngeal catarrh, but to no greater degree: that, while smoking is a pernicious habit —or perhaps rather a dirty habit—its influence on catarrh of the upper air-passages is much overestimated; and while in many cases it aggravates an existing trouble, and consequently the habit should be interdicted, yet in most cases it is harmless. It is my belief, in regard to this vexed question, that the absorption of nicotine, in excessive smoking, is the harmful feature of it, not the local, irritating qualities of tobacco smoke on the air-passages, and that the physician's advice in regard to its use should be based more upon its influence on the general system than on its local effect. It may be stated, however, in this connection, that, as a matter of clinical observation, the injurious effect of smoking, or the use of tobacco in any form, is more marked and noticeable in chronic follicular troubles than in simple catarrhal inflammations.

In addition to the avoidance or removal of those causes which aggravate or predispose to laryngeal catarrh, certain measures should be resorted to for the correction of the morbid condition in the organ. These consist in the application

directly to the laryngeal mucous membrane of remedies whose action is to reduce congestion, arrest abnormal secretion, and, in short, give tone to the membrane and indirectly to the muscles. This brings us again to the question of topical applications in the larynx already alluded to. Little remains to be said here in addition to what has already been stated. What is true in regard to acute affections in the larynx is also true in regard to the chronic. The laryngeal membrane is extremely sensitive, and intolerant of the introduction of foreign bodies, whether introduced by accident, or by design at the hands of the surgeon; hence, any method by which we can make applications to the larynx, without irritating it, would seem desirable. The atomizer accomplishes this purpose better than any other method we possess for local applications; hence, where available, its use should always be resorted to in preference to any other. The proper method of managing applications to the larynx, by means of the atomizer, has already been described, page 59. Free access to the laryngeal cavity for the spray is occasionally prevented by an overhanging epiglottis or some other impediment. In these cases resort will necessarily be had to the use of the brush or sponge. My own preference is, however, for the cotton pellet—a small piece of cotton being twisted firmly on the end of a laryngeal probe. If properly prepared there is no danger of its becoming detached, and it takes up but a moderate amount of the fluid to be used.

This is one of the diseases in which nitrate of silver is of the greatest value, if used of the proper strength, and of great injury if improperly used. It should be applied of the strength of gr. iij.—xv. to ℥ j. The stronger solutions are not only liable to excite most painful spasm of the glottis, but are also positively injurious. Nitrate of silver is not only an astringent but is a powerful stimulant, and this is one of the ends to be sought in the treatment of the disease under consideration. The grade of inflammation is an extremely slow and sluggish one, and the morbid process essentially chronic, hence the first end to be sought is the stimulation of the nutritive processes of the membrane to a healthier activity. Next in the order of preference to the nitrate of silver should be placed chloride of zinc, which may be used of the strength of gr. v.—xv. to ℥ j. Among other remedies possessing efficiency are, zinci sulph.,

gr. x.—xx. to ʒ j., cupri sulphat., gr. v.—xv. to ʒ j., alum, gr. x.—xx. to ʒ j., potassæ chlorat., gr. x.—ʒ ss. to ʒ j., etc.

Powders are occasionally recommended in this affection; they should, however, as a rule, never be used in any catarrhal inflammations in the larynx, as the irritating qualities of the powder are liable to cause more injury than can be counterbalanced by any good which may be accomplished by the astringent which it contains. The use of the syringe in laryngeal catarrh should never be resorted to, as the bulk of the fluid which it carries is apt to excite severe spasm. The use of steam inhalations or vapors should be avoided in this affection or in any form of chronic inflammation, as their tendency is to produce congestion and relaxation of the parts, which are the conditions which it is the effort of the physician to control. As a rule, it is well, before using the astringent application, to throw a cleansing solution, by means of the spray apparatus, upon the diseased membrane, thus removing the mucus which covers it, and allowing the astringent or other medicament to come directly in contact with the membrane itself.

In making these applications careful attention should be paid to the directions already given on page 60, for spraying the larynx, care being exercised not to weary the patient, or to weary the organ by allowing the atomized fluid to play upon it more than a few seconds at each introduction of the tube, nor to repeat the procedure too often. In the intervals of treatment the patient oftentimes will be benefited by the use of cold inhalations of one of the astringents given above, used with a simple atomizer such as that shown in Fig. 63, or even one of the small cologne atomizers which are found on any toilet table.

While under treatment, the patient must be absolutely forbidden to subject the larynx to the strain or weariness which its use in singing or public speaking would necessarily entail. It is well also to avoid the too prolonged use of the voice even in ordinary conversation.

At best the treatment of chronic laryngeal catarrh, by topical applications and general hygienic measures combined, is very unsatisfactory unless it is remembered that in a very large majority of cases the disease is directly due to a pre-existing condition, as nasal catarrh, pharyngeal catarrh, an elongated uvula, etc., and that the laryngeal disease can only be cured by first removing its exciting cause.

In addition to the above outlined plan of treatment there should be borne in mind the tendency of the inflammatory condition to impair to an extent the muscular structures, and these must therefore receive attention. For this reason the use of the faradic current should be resorted to, in addition to the topical medication. For this purpose I generally use the ordinary single-cell office battery, holding one electrode in the hand and directing the patient to hold the other. The application is then made by placing the other hand over the thyroid cartilage, as near as possible to the anterior insertion of the thyro-arytenoid muscles. This plan I have found to answer an excellent purpose, as it avoids the unpleasant features of passing the electrodes inside the laryngeal cavity.

Œdema of the Larynx or Œdema Glottidis.

Owing to the fact that the mucous membrane lining the laryngeal cavity is loosely attached to the parts beneath, and that the submucous cellular tissue admits of considerable play of the membrane upon the parts to which it is attached, the occurrence of serous exudation within the submucous tissues is of not infrequent occurrence. This is especially true in children where the mucous membrane is far more loosely attached in the cavity of the larynx than in adults. The affection may be caused directly by the inhalation of irritating vapors, chemical irritants, hot steam, etc., or by the swallowing of acrid poisons which give rise to an inflammation of the fauces which extends to the larynx. It may result also from the presence of foreign bodies. In addition to these direct causes there are certain predisposing causes which have a very powerful influence in producing this affection where there already exists some slight local morbid condition inviting the œdema; occasionally, however, acting directly without any apparent predisposing cause. These affections are acute and chronic nephritis, or Bright's disease, obstructive disease of the heart, emphysema of the lungs, fibrous phthisis, or any disease whose tendency is toward the production of dropsy, localized or general. The direct result of these affections may be the production of œdema of the larynx, but, as a rule, there

is some condition which invites serous exudation to the part, as a chronic laryngitis, ulceration, or tubercular disease, etc. The onset of the attack is usually very sudden, and the obstruction to respiration, which is the prominent symptom of the disease, and the one feature which renders the affection an extremely grave one, sets in almost immediately.

The dyspnœa at the commencement of the attack is usually with inspiration alone, expiration being easily accomplished. This is owing to the action of the inward current in crowding together the swollen ary-epiglottic folds, which thus act as a sort of a valve. This soon disappears, however, and the obstruction shows itself in both acts of respiration. The subjective symptoms are very marked and distressing in character, the breathing becomes very labored, all the muscles of the chest are brought into vigorous action to assist in carrying on the respiratory act, and the painful effort by which this is done and the manner of its accomplishment, is evidenced by the pallid features, the staring eyes, the cold perspiration standing out upon the face, the restless tossing of the patient, with the terror and anxiety which characterize every movement and appearance. These symptoms, however, merely point to laryngeal obstruction, from some cause, and a certain diagnosis can only be made by digital and laryngeal examination.

Examination.—Occasionally, by depressing the tongue, the crest of the epiglottis will be brought into view, standing up prominently at its base, and presenting the characteristic œdematous, watery, semi-translucent tumefaction which marks the disease. This method of examination, however, is not usually available. By passing the finger back over the base of the tongue it will generally be found feasible to explore the laryngeal cavity, and to recognize the existence of the œdema, and also its extent. The introduction of the laryngeal mirror, however, will complete the diagnosis. This must, of course, be done with considerable rapidity and deftness, as the patient, suffering from the intense dyspnœa, can only with the greatest possible effort remain quiet sufficiently long to allow of an examination being completed. A rapid glance at the part by means of the mirror, however, will be sufficient to enable the observer to recognize the characteristic swellings which produce the obstruction. (See Fig. 112.) There will be

found projecting into the lumen of the larynx, as a rule, two rounded tumefactions which have their origin in the ary-epiglottic folds, and extending to and involving the posterior surface and crest of the epiglottis. At times the ary-epiglottic folds have the appearance of two rounded oblong masses, lying almost in apposition and showing an evident tendency to roll inward, as it were, upon the larynx, with every act of inspiration. The arytenoids form, also, small rounded masses which lie behind the diverging angle of the ary-epiglottic folds, completing the closure of the larynx, except the small triangular opening at the point of meeting, and even this may be so small as to be scarcely detected. The swelling is rarely of a symmetrical character, but is apt to be more extensive on one side than on the other, and at the same time of a somewhat irregular outline. If purely a case of passive œdema, as the result of Bright's disease, cardiac disease, etc., the swollen masses will present a grayish-white semi-opaque color, with a humid or watery appearance verging on a pinkish or reddish color where the œdematous swelling emerges from the more closely attached membrane which is free from œdema. If, however, the attack is due to a direct irritating cause, as in acute laryngitis, or the result of the inhalation of hot steam, flame, irritating vapors, or the presence of a foreign body, there are seen the evidences of active acute inflammation of the membrane which is, according to the severity of the inflammatory process, of a deep fiery red or deep pink color, fading to a whitish-gray in those parts most distended by the fluid exudation. It is covered more or less with thick frothy mucus or sero-mucus, the removal of which becomes difficult or impossible by any effort on the part of the patient, partly from the paralysis of the villi of the membrane, and partly from the general impairment of the functions of the whole laryngeal apparatus.

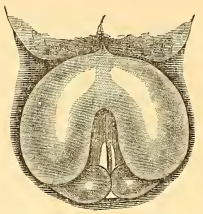

Fig. 112.—Œdema of the glottis. (Cohen.)

Treatment.—If the affection is one of pure and uncomplicated œdema, the result of a general blood condition, or is caused by heart or kidney disease, it is questionable if any of the ordinary local applications will be of any benefit. In these cases the œdema comes on so suddenly, and the grave symp-

toms develop so early in the attack, that it is only by the most prompt and efficient measures that the physician will be enabled to give relief to the obstruction before a fatal termination. In fact, in many of these cases, the disease runs its course so rapidly that death ensues before the physician can be summoned. Without waiting, therefore, for the doubtful results of local applications, the physician should proceed immediately to the tapping of the little bags of serum and letting the water out, in which case they will be seen to collapse almost immediately, and the dyspnœa be relieved. This operation is not necessarily a difficult one and can be performed without the use of the mirror. The finger of the left hand being passed down to the larynx, the proper scarifier held in the right hand is carried down, and, using the left finger as a guide, several long sweeping incisions are made into the membrane when it will collapse readily.

The use of the mirror, if feasible, renders the operation

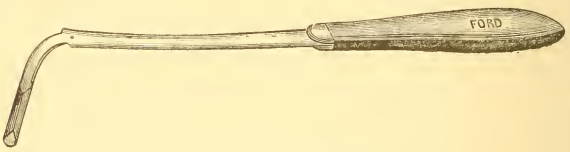

Fig. 113—Buck's laryngeal scarifier.

more simple, in that the point of the knife can be easily seen, and the depth and extent of the incisions carefully guided, and at the same time the whole of the œdematous swelling, as far as it extends, can be scarified. An ordinary sharp pointed, curved bistoury, with its blade wrapped with twine up to within a quarter of an inch of its point, may be used in the absence of any better instrument, or the ordinary gum lancet of the pocket-case proves a very serviceable substitute for the laryngeal scarifier.

Fig. 113 shows Buck's laryngeal scarifier, which is a more serviceable instrument if at hand.

Tobold's lancet, Fig. 114, which consists of a small lancet concealed within a tube, and which is only protruded at the instant of use, is probably as good an instrument as can be de-

vised for this operation. Its manipulation should be guided by the mirror. If the dyspnœa is not relieved by scarification, preparation should be made for tracheotomy, and this should be done if the symptoms at any time become alarming.

In œdema from acute laryngitis, tuberculosis, syphilis, or any of the localized diseases of the larynx which tend to the production of serous exudation, resort may be had with benefit to the use of some mild astringent in connection with steam inhalations. In these cases preference should be given to the use of some of the metallic astringents, among the best of which are, ferric alum, alum, or sulphate of iron, ten grains to the ounce. These may be used with the steam atomizer shown in Fig. 66, the inhalations being given as often as every hour. If

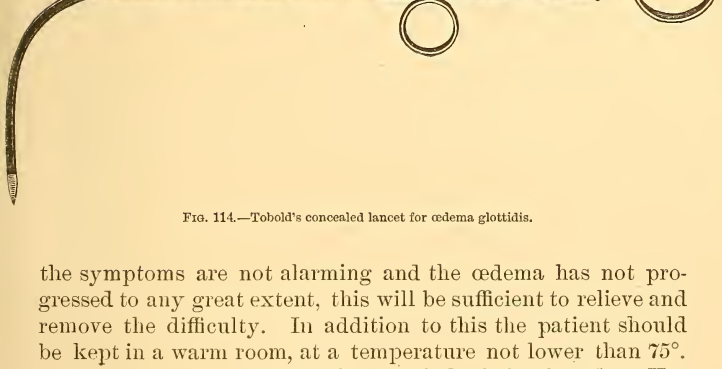

Fig. 114.—Tobold's concealed lancet for œdema glottidis.

the symptoms are not alarming and the œdema has not progressed to any great extent, this will be sufficient to relieve and remove the difficulty. In addition to this the patient should be kept in a warm room, at a temperature not lower than 75°. Applications about the neck are of doubtful benefit. Hot fomentations, poultices, blisters, and sinapisms have all been recommended, as well as cold applications, ice-bags, etc., over the larynx. These applications certainly add nothing to the comfort of the patient and probably nothing to the relief of his œdema, and it is quite as well, as a rule, to leave the neck open for the free play of its muscles, and perfectly clear and clean, depending entirely on the internal applications in the order of the urgency of the symptoms, with the certainty always that

if necessity demands, the physician has at hand in tracheotomy a resort which will be thoroughly effectual in counteracting all dangerous tendencies, and which should be promptly resorted to when astringent inhalations or scarification fail to relieve. After the performance of tracheotomy, topical applications may be resorted to for the relief of the local conditions which have given rise to the œdema, but in the case of primary œdema it generally subsides rapidly and requires no further treatment.

CHAPTER XVII.

LARYNGEAL PHTHISIS.

WITHOUT entering into the question of tubercle, in its relations to laryngeal phthisis, it is sufficient to say that the old controversy is apparently no nearer to a settlement than before, and that the advocates of one or the other side of the question hold to their convictions and report the results of their investigations with the same positiveness. My own convictions on the question are, that laryngeal phthisis is not necessarily of tubercular origin primarily, but of inflammatory origin; and that if tubercles are found on autopsy they are simply the scattered gray nodules which are frequently found about the base of any chronic ulcerative disease. This view is held as more perfectly harmonizing with the development and clinical history of the disease, and more clearly explaining the pathological changes met with during its course, than that view which upholds its tubercular character. Laryngeal phthisis may be defined as a disease characterized by the development in the mucous membrane of the larynx, under the influence of some marked, general, and non-specific dyscrasia, of an ulcerative process, chronic in character and slow in its destructive progress, which commences in the superficial layer of the membrane, and, if not arrested, extends to the deeper tissues, attacking the perichondrium and cartilages and involving them in caries and necrosis.

In the large majority of cases it occurs in connection with chronic pulmonary disease, but we meet with it alike in tubercular and non-tubercular disease of the lungs. As a rule it occurs after the development of the lung trouble. Many writers assert that it never occurs as a primary disease, but that it is always a sequela of lung disease. I have seen several cases in which the disease manifested itself in the larynx before it was possible to detect any pulmonary affection. In those cases,

however, in which the laryngeal phthisis is primary, there is always manifest a markedly impaired condition of the general health. It may also occur in scrofula, syphilitic asthenia, anæmia, chlorosis, Bright's disease, or any of those general conditions which seriously impair the health and weaken its power of resisting disease. The upper air-passages, exposed as they are to the first ingress of inspired air, with its varying temperature and condition of dryness or humidity, exposed also to the deleterious influence of whatever of impurities it may contain, such as irritating vapors or gases, and particles of dust, are exceedingly liable to take on catarrhal inflammation. The larynx is also the seat of a constant functional activity in the various movements involved in the acts of phonation, respiration, and deglutition, the influence of which, in aggravating an existing morbid condition, we are liable to underestimate. If, then, a patient, suffering from any general dyscrasia such as Bright's disease, scrofula, chlorosis, anæmia, etc., or any of the conditions which lower the vitality of the system and lessen its power of resisting disease, from any cause acquires a laryngeal catarrh, it is easy to understand how the simple catarrhal inflammation of the membrane may lapse into an ulcerative process, and there be developed that condition which we call laryngeal phthisis. That the constant movement to which the larynx is subject, plays an important part in the causation of laryngeal phthisis, is still further shown by the fact that the most frequent manifestation of the disease is seen in that portion of the organ which is subject to the most constant and restless motion, viz., the arytenoid cartilages and inter-arytenoid commissure, the special movements taking place in these being such as would naturally tend to aggravate and irritate an inflammatory condition ; the commissure being folded upon itself and squeezed as it were between the cartilages with each act of phonation and respiration.

A large proportion of cases of the disease occur in connection with, or subsequent to the development of pulmonary disease. The true explanation of this is, that the pulmonary phthisis is largely the cause of the laryngeal phthisis, not that the two are necessarily developed from one and the same cause. The majority of cases of lung disease are attended with more or less catarrh of the mucous membrane lining the larynx. This catarrh is aggravated by the constant motion to which the

parts are subjected in phonation and respiration. The constant cough which attends the lung disease cannot but be an additional source of irritation, and besides this, the membrane is being constantly bathed by the discharges, often of a fetid and offensive character, which pass over it from below. If, now, the pulmonary disease be of such a nature as to lead to impairment of the general health, we have all the conditions favorable for the development of the affection under consideration, for I am convinced that impaired vitality is a most essential factor in its causation.

Primary laryngeal phthisis, if not arrested, leads to the development of pulmonary disease. It is generally said of these cases that the pulmonary disease already exists, but is masked by the laryngeal disease, and cannot be detected by physical signs. It is easier to believe that the pain, constant hacking cough, loss of sleep, interference with proper nutrition by the painful deglutition, and the fetid discharges poisoning every breath of inspired air, all prominent symptoms of the laryngeal disease, must necessarily aggravate the previously existing state of impaired health, and eventually lead to the development of further disease, which fixes itself upon the organ most closely connected anatomically and physiologically with the one primarily affected, viz., the lungs; the laryngeal disease acting as the direct cause of the lung disease. We thus have established a vicious circle, the one reacting upon the other, and both completing a picture of pain and suffering rarely exceeded in our experience.

The influence of laryngeal ulceration upon the general health, is again very markedly evidenced by those cases in which a foreign body, becoming lodged in the upper air-passages, gives rise to ulceration, followed by greatly impaired health, with emaciation, and eventually death from this cause, or concurrent lung disease.

Among the conditions under which laryngeal phthisis may develop are enumerated, the tubercular and scrofulous diatheses, malaria, and syphilis. The intimate anatomical and physiological connection between the larynx and lungs is sufficient to explain why a very large preponderance of cases of laryngeal phthisis occur in connection with the impaired state of health which attends chronic lung disease. Syphilis is included among the causes, and by this is meant more properly

what has been termed syphilitic asthenia, viz., that condition of markedly impaired health we sometimes meet with as the result of infection, in which all specific manifestations of the disease have disappeared. That in this condition laryngeal phthisis may develop, I entertain little doubt, having seen such cases, in which the progress of the disease and the character of the ulceration in no way resembled the more specific disease, but presented all the features of the ordinary laryngeal phthisis as described farther on.

Many writers, in treating of the disease, describe the first stage as one of anæmia of the larynx. This condition of anæmia of the mucous membrane of the larynx is not a rare one, and while it may in many cases exist before laryngeal phthisis, and perhaps excite suspicion, yet it does not point directly to the disease, and presents no features by which we can, with any certainty, recognize the threatened danger. There is, therefore, no sufficient reason for considering it a stage of the disease.

The first stage is that of pyriform thickening of the mucous membrane covering the arytenoid cartilages and inter-arytenoid commissure. This thickening is peculiar and characteristic. (See Fig. 115.)

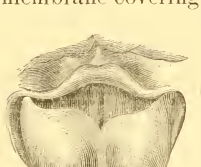

FIG. 115.—Showing the club-shaped thickening of the arytenoids in laryngeal phthisis. (Mackenzie.)

The contour of the cartilages is completely masked and concealed by a thick, club-shaped swelling, while the commissure bulges out in such a manner as to present a rounded mass anteriorly, which oftentimes interferes with the approximation of the cords, while at the same time it extends upward, so as to reach nearly to the level of the cartilages, and fills up the normal notch between them. The mucous membrane is reddened throughout the larynx and presents a moist, boggy appearance, especially over the swollen arytenoids where it is covered with mucus or muco-pus.

The second stage is that of infiltration of the epithelial coat of the mucous membrane. In this stage we first notice what constitutes a prominent feature of laryngeal phthisis, viz., an excessive cell-proliferation. There appears on the surface of the membrane a small, whitish-gray patch, slightly raised above the surface, and seemingly an infiltration of its epithelial layer.

This occurs, in the majority of cases, on the laryngeal face of the arytenoid commissure. Its next most frequent site is one of the ventricular bands, and then indifferently in other portions of the organ. These patches may present themselves singly when they may attain a considerable size, or they may present in groups. Their duration is very limited, as they rapidly run into :

The third stage, which is the stage of fully developed ulceration. This change I have watched in several cases and have seen the grayish patch gradually change from an apparently quiescent state to one of active discharge ; the superficial layer of epithelium being thrown off and new cells being produced, they gradually degenerate into pus-cells ; the surface of the formerly gray patch becomes yellow in color, the discharge becomes purulent in character and the ulcerative action becomes established. The ulcer extends by extending its margins and also by attacking and eroding the parts beneath ; and the waste of tissue commences which gives name to the disease. The ulceration may be small, or cover a comparatively large surface. It may be made up of a number of minute points of ulceration, as most frequently occurs when the disease attacks the epiglottis, or there may be several large ulcers distributed in different parts of the larynx. (See Fig. 116.)

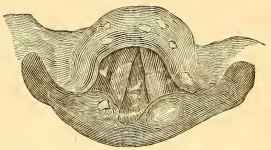

Fig. 116.—Scattered ulcerations of the third stage of laryngeal phthisis. (Mackenzie.)

In this stage we notice, more prominently, the excessive cell-growth which characterizes the disease. While the destructive ulceration goes on we find developed, sometimes on the ulcerated surface, but more frequently on its margins, small, pointed, warty growths, which may be so extensive, as almost to conceal and overshadow the ulcerative process. They are very soft, pliable, and easily removed. The error is sometimes committed of picking them off with the forceps, but experience teaches the wisdom of letting them alone, certainly until the ulcerations have been entirely healed.

During the second stage, often, but far more frequently during the third stage, there may occur a development of the disease of most serious import, in that it not only increases in a

marked degree the sufferings and distress of the patient, but also renders the prognosis very much more grave. This consists in the occurrence of an acute follicular inflammation, involving the mucous membrane of the epiglottis, expending itself mainly upon the follicles so richly distributed about the crest, or it may attack the arytenoids. Its onset is characterized by the sudden pouring out of an exudation into the follicles, of the same character, probably, as that which occurs in the second stage of the disease, as before described, but in the one case it infiltrates the epithelial layer of the membrane, while in the other it is deposited in and distends the follicles. It occurs with great suddenness, and without warning, a few hours often being sufficient for its development.

An examination of the parts at the onset of this form of the disease shows the epiglottis swollen and the mucous membrane in a state of active, acute inflammation. The crest is rounded, thickened, and turban-shaped (see Fig. 117), and on the surface of the swollen membrane are seen minute project-

FIG. 117.

FIG. 118.

FIG. 117.—Turban-shaped thickening of the epiglottis, together with club-shaped thickening of the arytenoids in laryngeal phthisis. (Mackenzie.)

FIG. 118.—General and destructive ulceration in the later stages of laryngeal phthisis, a large portion of the epiglottis having been destroyed. (Mackenzie.)

ing points, thickly distributed, of a pearly white or gray color, and slightly clouded as if seen through a diaphanous covering. The appearance resembles very closely that of the tonsil in a state of acute follicular inflammation, in which the morbid condition is probably much the same, with the exception that in the case of the tonsils, the follicles being so much larger and more capacious, the projecting gray points are far more prominent. The subsequent progress of this form of the disease is marked by the breaking away of the covering of the follicle, the purulent degeneration and discharge of its contents, and the formation of a minute point of ulceration at its seat, which, by a slow process, extends its margin until it coalesces with others,

and finally we may have the whole crest of the epiglottis and a portion of its posterior face involved in a sluggish and slowly destructive process of ulceration (see Fig. 118), the surfaces becoming clogged and covered with a dirty-looking grayish, muco-purulent discharge. This condition constitutes what is usually termed the epiglottic form of the disease, and is unquestionably laryngeal phthisis, but whether what has been described as the first stage is one and the same disease with this form may be questioned by some. Having carefully observed a number of cases which, resisting efforts to arrest the disease, passed progressively through all the stages, I am convinced that they are one and the same disease, and, therefore, would urge the importance of recognizing this fact, and hence the imperative duty of making every effort to arrest it in its early stages before the later and more intractable form of the disease has set in.

The other appearances which we meet with are secondary, and dependent upon the ulceration, such as acute catarrhal and phlegmonous inflammation of the mucous membrane lining the larynx, and not involved in the ulcerative action; œdema of the loosely attached portion of the mucous membrane, as the ary-epiglottic folds and the laryngeal face of the epiglottis; and perichondritis and necrosis of the cartilages.

Subjective symptoms.—As the above described conditions develop, the subjective symptoms become prominent. These are pain, cough, difficult and painful deglutition, hoarseness, if the cords are affected, and aphonia, if the thickened condition of the arytenoid commissure prevents their approximation.

In the first stage the symptoms are not prominent, there is an irritated condition, with a sense of pricking or tickling in the throat, and there may be some pain in swallowing, due to pressure on the filaments of nerves distributed in the swollen parts. As the disease progresses we have the severe and oftentimes exquisite pain due to the pressure to which the parts are subjected in the movements of respiration, phonation, and especially in deglutition. If the epiglottis is involved, the subjective symptoms become greatly aggravated, the pain and difficulty in swallowing become oftentimes most acute, and even the movements of the larynx, in respiration or talking, become a source of extreme suffering. The food is often regurgitated, and any attempt to swallow is made with reluctance,

on account of the exquisite pain caused by the act, the additional element of pain being due to the mechanical pressure of the bolus of food upon the inflamed surface.

Diagnosis.—In the later stages of the disease this is not difficult. The disease above all others with which it may be confounded is tertiary syphilis of the larynx, in which we have the rapidly destructive ulceration, the sharp-cut edges, the excavated surface covered with yellow pus, the absence of the warty growths which characterize phthisical ulcers, and especially the areola of red angry-looking mucous membrane which surrounds it, with the general condition of the patient, showing no marked evidence, usually, of impaired nutrition. In laryngeal phthisis, on the other hand, we have an essentially chronic process of ulceration; the edge of the ulcer ragged and irregular, but not excavated; the surface of the ulcer not markedly depressed, and oftentimes raised above the surrounding parts by the excessive cell-proliferation; the absence of the inflamed areola; and the general condition of the patient, always in bad health, and, in a large majority of cases this due to commencing or existing pulmonary disease; add to this the subjective symptom of pain which is characteristic of laryngeal phthisis almost without exception, and which is not prominent in syphilis, and the differential diagnosis is made comparatively easy. With lupus carcinoma, and the various neoplasms which are met with in the larynx, the disease need rarely be confounded.

But while the diagnosis is not difficult in the later stages, the question becomes an extremely important one, whether we have any certain means of recognizing the disease in the first stage, for I am confident that when early recognized it is in our power, in certainly a very large majority of cases, to arrest its farther progress. The condition described as the first stage of the disease, viz., the club-shaped arytenoid cartilages and the pyriform thickening of the commissure, is believed to be pathognomonic of laryngeal phthisis and is found in no other disease. This condition I have never yet seen except in this disease, or where the diagnosis has not been fully confirmed by the subsequent history of the case or by other confirmatory symptoms elicited at the time.

Prognosis.—We are usually taught that an improvement in the pulmonary symptoms is attended by an aggravation of

the laryngeal symptoms, and *vice versa*. This is but a partial statement of the case. In a given case of laryngeal phthisis, occurring in connection with chronic pulmonary disease, a sudden aggravation of the lung disease may be attended with an apparent amelioration of the subjective laryngeal symptoms. How this is so it is difficult to understand. Possibly the increased morbid action in the one organ may act as a derivative from the other, but that anything more than temporary relief of subjective symptoms occurs is improbable; and the same may be said of the converse. But these changes and interacting improvements occur entirely outside of, and independently of any therapeutic measures. In my experience an improvement in the laryngeal ulceration which is due to direct local treatment, is not followed by or attended with any aggravation of the lung trouble. On the contrary, the general condition improves, the lung symptoms are ameliorated, and in several cases I have detected unquestionably very decided improvement in the lung disease as shown by physical examination. Certainly in no case has it been possible to trace any direct connection between an aggravation of the one disease and an improvement in the other. In the earlier stages the disease is curable, in probably the majority of cases; and even after the occurrence of extensive ulceration and destruction of tissue I have seen cases recover. The occurrence of the follicular ulceration, described as attacking the epiglottis, renders the prognosis very grave; and in the majority of cases the only hope is to relieve somewhat. This can be accomplished in most cases.

Treatment.—This consists of four steps, which are regarded as of importance:

First.—The thorough cleansing of the parts preparatory for the more special application.

Second.—The application of such mild astringents, alteratives, or resolvents, as may be indicated.

Third.—The application of an anodyne to relieve pain or irritability, and to correct irritation caused by the previous remedies.

Fourth.—The application of iodoform as a specific in its action on ulcerations of mucous membranes.

The cleansing is best accomplished by one of the cleansing solutions given in the Appendix, preference being given to the

first. These are best applied by the Sass spray tubes with the compressed air apparatus, the pressure being about fifteen pounds. The application should always be grateful to the patient, and if there is any pain or irritation caused by it, the solution used should be reduced in strength, or changed. Care should always be exercised, of course, to avoid wearying the patient. If nausea or vomiting is caused the sitting should terminate for a time. After the parts are thoroughly cleansed, an anodyne solution should be used. This I regard as highly essential. Of these a five- to ten-grain solution of morphine may be used, with the addition of sodæ carb., or potass carb., to give it an alkaline reaction. A small portion of mucilage acaciæ added may increase its soothing effect. The next step in the treatment consists in the application of an astringent. In the order of preference, there may be used: tannin, gr. x.—℈ j., argenti nitrat., gr. j.—℈ j., zinci sulph., gr. iv.—℈ j.; the selection of the special astringent being governed somewhat by the effect and tolerance. Finally, there should be applied iodoform to the surface of the ulcer. This is used for its specific action; it is easily borne, rarely gives pain, and its effect in many cases is most satisfactory. The formula I generally employ is as follows:

℞. Morphiæ..... gr. x.
Tannin..... ʒ ij.
Iodoformi..... ʒ vi.
M.

Sometimes the saturated solution of iodoform in ether may be used, ♏ xl.—℈ j., but the powder is generally preferable. This application is made with the powder-blower shown in Fig. 47.

The diseased parts in laryngeal phthisis are extremely irritable and exquisitely sensitive, and the object should always be kept in view of accomplishing the treatment with as little irritation as possible. If, then, our remedies can be deposited on the parts, without the instrument touching them by which they are conveyed, it is an end to be desired. The spray and powder insufflator accomplish this; the brush, the sponge, and the probe necessarily touch the diseased parts and are liable to do harm. I long ago abandoned their use from

this consideration. Pursuing the plan of treatment indicated above, it is almost an invariable rule that the applications are not only well, but gratefully borne, and followed by immediate relief to the subjective symptoms.

The above plan of treatment is for the stage of ulceration. The earlier stages of the disease should be treated in the same manner, with the omission of the use of iodoform, which, as stated above, is only used for its specific action in ulceration. Inhalations, as a rule, are useless, or of very limited efficacy in laryngeal phthisis. The volatile remedies, which may be applied in this manner, exercise so little of curative or controlling influence on the disease that their use is a waste of time. Those remedies which are of most benefit by their local action cannot be volatilized. Lupulin, opium, cannabis indica, conium, and other sedatives are of some benefit in allaying pain, but it is limited. Benzoin, turpentine, creosote, and iodine are, as a rule, too irritating. Among the instruments in most frequent use, in the treatment of laryngeal phthisis, is the steam atomizer. This is an ingenious and attractive little instrument, but, nevertheless, an instrument of mischief in this disease. It is often desirable that the patient should have some method of using medicated solutions during the intervals of treatment, and for this purpose there is nothing better than the atomizer shown in Fig. 63. The fluid for use may be the carbolized alkaline solution given as a cleansing solution. To this may be added a sedative, if indicated, such as a drachm of Magendie's solution to the ounce.

In the earlier stages of the treatment it is desirable that the patient be seen generally as often as every second day, but that should be governed by the duration of the relief which is given at each sitting. At the commencement it will often be necessary to give daily treatment, but if the progress of the case be favorable it will soon be necessary to repeat the treatment but once a week, or even in two weeks.

These measures failing to relieve or arrest the progress of the disease, the question of tracheotomy arises as a remedial measure in the earlier stages of the disease, before œdema with dyspnœa have occurred, which, of course, may imperatively demand the operation. The consideration which operates in favor of tracheotomy is the entire rest thereby secured to the larynx from the movements of phonation and respiration, thus

putting the parts in the most favorable condition to recover. The consideration which operates against tracheotomy is the total ablation of a large and important part of the upper air-passages, by which the inspired air is rendered warmer, moister, and cleaner before it reaches the lungs. This consideration should never be lost sight of, and if the objection can be obviated by proper measures, which will occur to any one, it would seem that we have a resource which might more frequently be adopted. The operation is a simple one, and is rarely attended with any bad results due to the operation itself—such as shock, excessive hemorrhage, etc.

In closing, there are certain conclusions which I would suggest as being well grounded. These are: 1st, laryngeal phthisis may develop from a simple catarrhal inflammation, if there exists an impaired state of health from any cause; 2d, the progressive stages are catarrhal infiltration, catarrhal ulceration, and follicular inflammation; and tubercle, as a rule, plays no part in its primary causation or development; 3d, the disease is far more amenable to treatment than is generally taught, especially if treated in the earlier stages; 4th, tracheotomy is justifiable as a remedial measure, when local remedies fail to relieve, and before it is demanded by dyspnœa from inflammatory stenosis.

CHAPTER XVIII.

SYPHILIS OF THE LARYNX.

Local conditions due to the syphilitic poison may develop in the larynx at any time from the fourth or fifth week after the primary infection to the end of life. Those affections which occur within one or two years after infection, we are accustomed to regard as belonging to the secondary stage of the disease. In this period we meet with syphilitic catarrh of the larynx and mucous patches. Among the affections which are classed under the head of tertiary manifestations are chronic catarrhal laryngitis, superficial ulcerations, and deep ulcerations, with their resultant necrosis of cartilage and deforming cicatrices. This division into two groups of secondary and tertiary syphilis is somewhat arbitrary, and we not infrequently meet with syphilis of the larynx which we cannot with certainty assign to either the secondary or tertiary stage, and our decision will be based mainly on the clinical history of the case. Subacute catarrh invariably belongs to the secondary stage, while mucous patches or superficial ulcerations may be met with either early in the history of the disease or very late, while the chronic laryngitis of syphilis also may belong to the clinical history of secondary or tertiary syphilis; in the majority of cases, however, the latter is a tertiary manifestation of the disease.

Subacute Catarrh of the Larynx in Syphilis.

This affection generally makes its appearance from six weeks to three months after the primary sore, and consists in the development in the mucous membrane of the larynx of a catarrhal inflammation acute in character, yet of a mild type, presenting much the same appearances as an idiopathic sub-

acute catarrhal laryngitis, and from which it is, as a rule, extremely difficult to distinguish it. Laryngeal disease, however, is very liable to make its appearance in connection with the eruption on the skin, so that the clinical history oftentimes will aid the diagnosis. In addition to this there are certain appearances on laryngoscopic examination which are frequently met with, and which characterize the syphilitic laryngeal catarrh in contradistinction from the non-specific affection. In place of the uniform, broad, rosy tint, which is seen in the latter affection, there will be noticed, if the affection is specific, that the membrane is of a deeper color, with a tint which verges somewhat on a purplish hue, and also that the discoloration is not perfectly uniform, but that it is apt to be somewhat mottled, not unlike the eruption of roseola on the skin. Aside from this deepened color and mottled appearance we have no means of distinguishing the specific from the non-specific form of subacute laryngeal catarrh. The subjective symptoms are identical in the two affections and may be briefly summarized as a more or less complete loss of voice, with a slight sense of irritation or tickling in the throat, with a cough of a stridulous character, together with a moderate excess of secretion.

Treatment.—The treatment of this affection consists in the administration of mercurials under the same rules which govern the management of any case of secondary syphilis. In addition to this it is well that some local treatment should be resorted to, to limit and control the local affection, which may lapse into a chronic laryngeal catarrh, which is liable to persist after the systemic disease has been cured. The local treatment should be the same as that of a subacute laryngitis.

Mucous Patches in the Larynx.

This manifestation of syphilis, though undoubtedly an extremely rare one, unquestionably is met with occasionally in the larynx. It may occur, as do mucous patches in other portions of the respiratory tract, at any time, from three months to five or ten years after the primary sore, though, as a rule, it is met with in the early history of the disease, and therefore should be classed among the secondary manifestations. I have never seen but two cases in which I have felt convinced of the

presence of a mucous patch in the larynx. In each of these cases it occurred on the false cord. Other cases have been reported of mucous patches on the true cords, the arytenoid commissure, and epiglottis. The reported cases, however, are so few that it is difficult to generalize from them as to the point or part of the laryngeal cavity which is the most frequent site of their development. When seen they present the same appearance as mucous patches found in any other portion of the mucous membrane of the upper air-passages, viz., the bluish-white opaque infiltration of the membrane, circumscribed in extent and elevated somewhat above the surface (see Fig. 119). On account of the functional activity which characterizes the larynx, and the necessary irritation to which any morbid process in the organ is subjected, the tendency to ulceration which characterizes the mucous patch in other portions of the air-passages, is, of course, markedly aggravated in this region. Hence, it becomes by no means improbable that a mucous patch may very frequently be the starting-point of a superficial ulceration, and that therefore many of these cases which only come under observation after the ulcerative process has set in, may have had their origin in this manifestation of the disease.

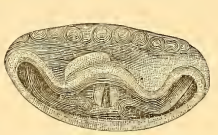

FIG. 119.—Mucous patch on the upper surface of the epiglottis. (Mackenzie.)

The symptoms of a mucous patch are, a sense of irritation in the larynx, with tenderness on pressure externally, painful deglutition more or less well marked, with impairment of voice dependent somewhat on the location of the patch.

Treatment.—In addition to general treatment, active local measures should be resorted to for the destruction of the patch; this is the more especially indicated if, as has been suggested, its tendency is to lapse into ulceration. The patch should be touched daily, at the beginning, with the solid stick of nitrate of silver. This is best accomplished by fusing a small portion of the caustic on the end of a bent probe, and carrying it down to the part by the aid of the laryngoscopic mirror. The disappearance of the disease is much aided by the application of iodoform to the cauterized surface. The combination of these two remedies has proved more effective in my hands, in the management of these patches, than any other, although either remedy used singly will be found of

much benefit. Occasionally, in place of the solid stick, a solution of the caustic may be used of the strength of gr. xl.—3 j. to ℥ j. This may be applied by means of the cotton pellet and the laryngeal probe. Other destructive agents, as nitric acid, acid nitrate of mercury, chromic acid, etc., are probably equally efficacious; but none of them afford the same convenience of manipulation as does the nitrate of silver.

It is unnecessary to add that, in connection with local treatment, the internal administration of mercury is of the utmost importance, and that it should be commenced immediately, and followed up actively and persistently in this oftentimes most troublesome manifestation of syphilis. Equally true is it, also, that internal medication is inadequate, as a rule, to cope with these patches without also local destructive agents.

Chronic Catarrhal Laryngitis of Syphilis.

This manifestation of syphilis in the larynx makes its appearance in the later stages of the disease. It might well be designated as laryngitis deformans of syphilis—a name which describes the disease more perfectly than the one used above, and is the one which would be adopted but for a natural hesitation in introducing a new name to our nomenclature, which is already overburdened by its many and oftentimes confusing terms. The disease is a chronic inflammation of the mucous membrane lining the larynx, due to the syphilitic poison, and characterized by certain morbid processes, which produce very serious deformity of the organ with impairment of function, yet without necessarily the occurrence of any ulceration or other destructive process. It is generally a tertiary lesion, occurring, from five to fifteen years after the primary sore. It commences with an apparently simple sore throat, with moderate congestion of the mucous lining of the larynx, and gradually progresses until there may eventually arise, as the result of the infiltration and thickening of the membrane, and encroachment on the laryngeal cavity, a condition of stenosis which may involve extremely grave consequences, unless relief is speedily afforded. In the early stages the affection is apparently a simple laryngeal catarrh; but it is more than this, for a close inspection will reveal the fact that the morbid

process has already commenced in the deeper tissues of the membrane, with more or less congestion of its surface.

This process, in the deep layer, consists in a deposit of glandular and connective-tissue elements which, progressing by slow degrees, produces the deformities which characterize the later stages of the disease. This deposit or thickening does not occur evenly, but seems to manifest itself in one part of the organ more than in another, producing irregular and somewhat nodular elevations, scattered throughout the membrane. These elevations do not give rise to rounded, tumefied swellings, but merely to a somewhat rugged condition of the lining of the larynx. The process is essentially a chronic one, and develops very slowly, months, or even years, being required for the manifestation of the graver symptoms. It does not seem to confine itself to any one portion of the larynx, but diffuses itself throughout the whole cavity, yet being more active in one portion than in another. If any portion of the organ is more frequently affected than another, it is generally one of the false cords or of the arytenoid cartilages, though occasionally we may find it attacking the epiglottis alone, while the parts below remain comparatively free ; though when this occurs we find, as a rule, that the swelling and infiltration is not symmetrical, but will show itself more markedly on one side, and this still of a somewhat irregular outline.

In a proportion of cases the prominent characteristic is its disposition to confine itself to one side of the larynx, or rather to develop on one side to a marked extent, while the opposite side remains comparatively unaffected or affected to but a slight degree. The mucous membrane does not present the bright, rosy hue of acute catarrhal inflammation, nor the characteristic discoloration of chronic catarrhal disease, but presents a deep, red color, verging on a purplish aspect. It is smooth and rounded, with an appearance of tension, and yet not the tension of œdema or phlegmonous inflammation, but with a thoroughly opaque aspect. It is moist and glistening, and covered with thin, frothy mucus.

As this condition develops in the larynx the subjective symptoms become prominent. The voice is very early affected, but in a peculiar manner, it is not lost entirely nor is it a hoarse voice, but it takes on a rough, rude, raspish character, which is peculiar to this form of syphilitic laryngitis. This is espe-

cially marked when one or both of the cords are involved in the morbid process. There is pain referable to the fauces, a sense of rawness, or irritation in the throat, with difficulty in swallowing, more or less well marked according to the parts affected. If the epiglottis is involved the pain is more prominent, but it is a dull pain, never of a lancinating character, but more of a sense of discomfort. This symptom is always present to an extent, with more or less tenderness on external pressure, but is never present to the extent we find it in the ulcerative laryngitis of syphilis, or in laryngeal phthisis. There is more or less cough present, of a hacking character, but this is not a prominent feature of the affection.

Examination.—On examination with the laryngoscopic mirror, the first and foremost feature that will be noticed is a lack of symmetry in the larynx, and the membrane lining it will be seen of a dark red, injected color, covering an apparent tumefaction. If the disease involves one of the false cords, this will be seen to project more or less from its normal site, and the true cord of that side will be partially masked, or completely hidden. If one of the arytenoid cartilages is involved, it will stand out prominently and apparently overtop its fellow. If the epiglottis is involved, it will be noticed that it is contorted or twisted out of shape, its crest will be swollen and somewhat turban-shaped, but still covered by the discolored, opaque mucous membrane. When the cords are involved, on account of the extreme thinness of the membrane, the thickening will be slightly marked, but still noticeable to the extent of interfering seriously with their free vibration. The character and extent of the swelling of the cords will be still more noticeable, and more easily estimated by a close examination of their free borders, which will be seen to have lost their straight line, and will present a somewhat scalloped edge, but still irregular, and with a slightly ragged aspect. The motion of the cords will not be necessarily interfered with, except mechanically. If the arytenoids and commissure are involved, the free motion of the cords will be of course impaired according to the extent of the swelling. This may exist to such a degree as to produce almost complete arrest of motion, in which case a mistake in diagnosis might easily be made. A careful inspection, however, will enable the observer to estimate, with precision, how far the apparent paresis is due to the mechanical obstruction to the free movement

of the cords, and also to detect that there is unquestionable movement in the parts, and that of a symmetrical character. This, of course, would not exist if there were genuine paralysis, as in this case the loss of movement would be complete, and in a majority of cases unilateral.

If the disease has advanced to the extent of producing interference with respiration, as it does in many instances, the examination will show the entrance into the laryngeal cavity markedly narrowed and encroached upon by its thickened lining membrane, the point of stenosis being generally at the upper orifice of the larynx, lying between and produced by the swollen false cords and epiglottis.

Diagnosis.—Even to one familiar with laryngoscopic examinations, the recognition of this disease is by no means always an easy matter. The absence of ulceration, which a close inspection will reveal, necessarily excludes laryngeal phthisis and also the ulcerative diseases of the larynx due to syphilis. The only diseases with which it may be confounded are chronic catarrhal laryngitis and tumors. Occasionally the thickening of the mucous membrane which attends the affection under consideration may so localize itself as to present the appearance of a tumor. This is especially true when it is confined to one of the false cords. A close inspection, however, and study of the part ought to enable the observer to differentiate between the localized tumor and the diffused infiltration of the mucous membrane in the specific affection. Chronic catarrhal laryngitis, with congestion and a moderate degree of swelling, always displays a perfectly uniform and symmetrical injection of the membrane ; whereas, in the disease we are considering, perfect symmetry or uniformity of the tumefaction rarely if ever exists.

Prognosis.—The invasion of the larynx by any of the later manifestations of syphilis, or the establishment of one of the earlier lesions, by its fixing itself upon the part and lapsing into a chronic state, I regard as one of the gravest and most unfortunate of accidents ; hence the early recognition of the disease becomes of the highest importance. This can only be attained by the use of the laryngoscopic mirror. If recognized and correctly treated both internally and locally it is fairly amenable to treatment. In the later stages, however, when the larynx has become disorganized, and its function seriously interfered with as shown by the prominent subjective symptoms

of impairment of voice, etc., with the appearances on examination of the thickened and infiltrated condition of the membrane extending throughout the cavity, involving marked deformity, it becomes simply a question of arresting the further development of the disease. The restoration of the voice, of course, is impossible, but the prevention of further morbid action may be hoped for by active measures.

Treatment.—This consists in the administration of general remedies, under the rules which govern the management of constitutional syphilis. Iodide of potassium, in combination with muriate of ammonia, should be given in full doses as follows:

℞. Potass. iodidi..... ʒ vi.
Ammoniæ mur..... ʒ iij.
Aquæ..... ʒ iv.
M. Sig.—One teaspoonful three times a day.

The dose of iodide of potassium should be increased each third day by the addition of one drachm to the ounce of the mixture. This should be followed up for two or three weeks, when, in addition to the above, biniodide of mercury should be administered, simply adding two grains of the mercurial salt to the mixture. This should be given for from four to six weeks or longer, when, as a rule, the administration of the potash should be discontinued. If marked benefit has resulted from its exhibition well and good, but if no result has been obtained its future administration is probably useless, and the mercury alone should be continued from twelve to eighteen months. The iodide of potash should be abandoned for two reasons: first, its tendency to produce congestion of the mucous membrane of the upper air-passages, thereby increasing the sufferings of the patient; and secondly, on account of the deleterious effects on the kidneys attending its long-continued administration. In addition to the internal administration of mercury, mercurial vapor baths may be given occasionally, with benefit, or inunctions of the ointment. The above plan of treatment is the one I have usually pursued, but of course in each case the administration of internal remedies at the hands of the physician may be governed by his best judgment as to their immediate effect. In addition to the general treatment, topical measures should be resorted to for the control

of the local morbid process. These should consist in the daily application to the laryngeal membrane of such remedies as exert a specific influence in reducing the swelling of the parts and limiting the extension of the disease. In the application of these remedies I still entertain a decided preference for the use of atomized fluids, applied by means of the compressed air-apparatus, Fig. 65, or the hand-ball atomizer, Fig. 61. In the absence of these or any means of using fluids in the state of atomization, resort may be had to the use of a sponge-holder such as that shown in Fig. 53, or the pellet of cotton wrapped firmly on a probe.

Before making any application, the diseased surface should be thoroughly cleansed by the use of one of the cleansing solutions given in the Appendix. Having thoroughly removed the mucus that covers the diseased membrane, there should be applied one of the following solutions, in the order of preference:

℞. Hydrarg. bichloridi ..... gr. ij.
Morphiæ sulph ..... gr. iv.
Glycerinæ ..... ʒ j.
Aquæ ..... ℥ j.
M.

℞. Zinci chloridi ..... gr. vi.—x.
Morphiæ sulph ..... gr. iv.
Aquæ ..... ℥ j.
M.

℞. Argenti nitrat ..... gr. v.—xv.
Aq. ext. opii ..... gr. vi.
Aquæ ..... ℥ j.
M.

The local action of the morphia or opium I regard as of especial value in all of the graver and more painful affections of the larynx. They not only serve to allay irritation, but seem to exercise either a direct curative effect on the part, or to aid in a marked manner the efficacy of the other local remedies used. They may be used as in the above prescriptions, or even in stronger solutions.

These applications should be repeated daily under the direction given for making laryngeal applications, and should not

only be attended with immediate relief, but should always be borne gratefully by the patient. As the treatment progresses, however, the applications may be made with less frequency, twice a week, once a week or even less being sufficient. It has been said in regard to local treatment of syphilitic disease of the larynx, that little or nothing is to be accomplished by it, but that the main reliance should be on internal medication. Of course local treatment will be of scant avail unless combined with internal medication; but that nothing is to be accomplished by topical applications is a broad statement, and one not to be entertained. Very much more can be accomplished by active local treatment, combined with internal medication, not only in the arrest of the further progress of the affection, but in the rapid removal of the existing morbid conditions, than can be expected by the administration of internal remedies alone. Hence, in the management of a disease so grave in its possible results as this form of syphilitic laryngitis, the whole duty of the physician has not been done unless the patient shall receive the full benefit of both internal and local medication.

Ulcerative Laryngitis of Syphilis.

Among the more frequent manifestations of syphilis in the larynx is that of ulceration, characterized by a more or less rapid and progressive loss of tissue. As a rule it belongs essentially to the tertiary stage of the disease, though we may occasionally meet with it in the earlier epoch or secondary stage. It manifests itself in two distinct forms, which we may designate as superficial ulceration and deep ulceration, from the more striking characteristics of each. The superficial ulcer belongs more frequently to the earlier stages, while the deep ulcer is essentially a tertiary lesion.

Superficial Ulcers of the Larynx in Syphilis.

This consists in the development in the mucous membrane of the larynx of an ulcerative process which confines itself mainly to the surface layer of the mucous membrane. It is somewhat limited in extent, and not characterized by any

marked destruction of tissue or rapidity of extension. In many cases probably it is due originally to a mucous patch, which, under the influence of locality, rapidly degenerates into an ulcerative process; for we recognize in all morbid processes in the larynx the unfavorable influence of the constant motion to which the parts are subjected in its different functions of deglutition, respiration, and phonation. This may explain the fact that the mucous patch is so rarely seen in the larynx, for when such manifestation does occur, owing to the constant irritation to which it is subjected in that locality, it so rapidly degenerates into an ulceration that when it comes under observation of the physician the mucous patch has disappeared and the superficial ulcer has taken its place. The superficial ulcer may, without question, also develop in the larynx as a local manifestation of the blood disease, without the intervention of the mucous patch. From what has been said it will be easily inferred that this manifestation of syphilis belongs to the secondary period, and yet we oftentimes find its appearance delayed for years after the primary sore. Without assigning it specifically to either secondary or tertiary syphilis it is sufficient to state that, as a rule, within three or four years after the primary lesion, but occasionally from eight to ten years after, we meet with the simple ulceration of the surface layer of mucous membrane which we designate as the superficial ulcer of laryngeal syphilis. Its most frequent site is on the false cords, and generally on their inner border. It occurs also not infrequently on the arytenoid commissure, and more rarely on the ary-epiglottic folds and face of the epiglottis. Occasionally we meet with it on the vocal cords themselves. It makes its appearance as a small, rounded erosion on one of the parts above named, which extends very slowly, still preserving its regular outline, and rarely spreads over any great extent of surface. Its surface is of a bright yellow color and covered with thick creamy pus. Its edges are flush with the mucous membrane surrounding the ulcer, and rarely, if ever, depressed below its surface. The centre of the ulcer, however, is slightly depressed, sloping upward to the level of the mucous membrane surrounding it. In its extension it assumes an oval shape and extends longitudinally with the antero-posterior axis of the larynx, as along the false cords and ary-epiglottic folds from before backward. The mucous membrane surrounding the

ulcer is somewhat reddened, presenting a deep rosy tint, having a faint hued areola, which, however, is not to be confused with the fiery red, angry looking areola of the mucous membrane surrounding the deep-seated ulcer to be described. The contrast between the ulcerated surface and the surrounding membrane is well shown in Fig. 120. There is a considerable discharge of bright yellow pus from the surface of the ulcer, mingled with a moderate amount of ropy mucus, discharged from the mucous membrane of the surrounding parts. When this form of ulceration occurs on the vocal cords its appearance is greatly modified by the extreme thinness of the mucous membrane covering them and its scant supply of blood-vessels. Owing to these causes the prominent appearances, on inspection, are so modified that the ulcerative action may easily be overlooked unless careful inspection is made. It generally makes its appearance on the upper surface of the cord and near its free border. Occasionally it may extend over the edge of the cord, in which case, being seen in outline, it is more easily recognized. The mucous membrane being, as before remarked, extremely thin, the ulcerative process involves more nearly its entire thickness, and we recognize the small, rounded spot on the cord of a somewhat pale yellow color and faintly irregular or jagged outline, and surrounded by an areola, limited in extent, of faintly injected blood-vessels. The color of the ulcer stands in no marked contrast with the mucous membrane surrounding it, but a close inspection will reveal it as an undoubted ulcerative process. Its surface is somewhat depressed below the surrounding parts and secretes a small amount of muco-pus.

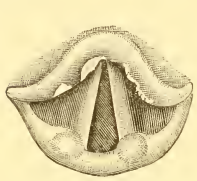

FIG. 120.—The superficial ulcer of laryngeal syphilis on the posterior face of the epiglottis. (Mackenzie.)

Symptoms.—The subjective symptoms which attend the development of this form of ulceration are not prominent. There is a sense of discomfort or rawness, occasional complaint of which is referred to the larynx, with more or less impairment of voice and occasionally difficult or painful deglutition. The symptoms, with reference to the voice, mainly depend on the locality of the ulceration; if this occurs on the vocal cord the voice becomes rough and rasping in character, and markedly lowered in pitch; if, however, the false cords or epiglottis is

involved the voice is simply somewhat husky ; if the commissure is involved the voice becomes aphonic, in consequence of the mechanical interference with the proper closure of the cords. If the morbid process locates itself on the epiglottis or upon the arytenoids there is apt to be more marked pain in swallowing. There may be some tenderness on external pressure over the thyroid cartilages, but this is never marked. In general, it may be said, however, that all the above symptoms may be prominently present, or so slightly manifested that the diagnosis will only be made on careful laryngoscopic examination. The diagnosis will be comparatively easy in the majority of cases, if the assertion already made is true, that ulceration of mucous membrane is not the very common occurrence it is by many believed to be, but is only due to some profound blood-condition ; hence these slighter forms of ulceration are only met with, as a rule, in syphilis and laryngeal phthisis. The differential diagnosis between syphilitic ulceration and laryngeal phthisis will be aided largely by the clinical history of the case ; as between the disease under consideration and the third stage of laryngeal phthisis, described on page 289, the points of difference are not markedly prominent as regards the ulcerative process itself, but in laryngeal phthisis there will be found the club-shaped arytenoids, the chronic laryngeal catarrh, together with the seriously impaired general health which characterizes that disease ; these conditions are not found in syphilis. In the chapter on laryngeal phthisis, one of the causes alluded to as leading to that affection was syphilitic asthenia. It would seem that in the two affections there were many points of confusion, as in each case there is the previous syphilitic history followed by the development of an ulcerative process in the larynx whose characteristics are similar ; but in the case of laryngeal phthisis due to syphilis or syphilitic asthenia, as it has been called, there is the clinical teaching, which a close observation of the case would point out, of the future progress of the case toward destructive ulceration ; whereas, in syphilis, we have the same clinical history, the similar ulcerative process, but no marked impairment of health, and no progressive destruction of tissue ; with the subjective symptoms of laryngeal phthisis, such as distressing cough, and painful deglutition, almost entirely absent.

Treatment.—Iodide of potassium is of little avail in the man-

agement of this affection. The patient should be put immediately under the use of mercurials administered internally, and by baths or inunctions, under the rules which govern the treatment of any case of syphilis. In addition to this, local measures should be used for the arrest and removal of the ulcerative process. These should consist, first, of a thorough cleansing of the surface of the ulcer, by the use of one of the cleansing solutions given in the Appendix. These should be applied by means of the atomizer, in the absence of which, however, there is no objection to the use of the cotton pellet or sponge, as the larynx is not especially irritable in this disease, and the introduction of sponge or probe is not objectionable to the same extent as it is in laryngeal phthisis, where the parts are exquisitely sensitive, and where harm may be done by such rude procedure. After cleansing the surface of the ulcer it should be coated with one of the following powders:

℞. Iodoform,
Lycopodii.....āā 3 j.
M.

℞. Morphia sulph..... gr. ij.
Iodoform..... 3 j.
M.

℞. Iodoform..... 3 ij.
Tannin..... 3 j.
M.

These may be applied by means of the powder blower shown in Fig. 47. This instrument, of course, does not nicely localize the medication on the diseased surface, but that portion which is diffused over the surrounding membrane is soon voided, while that portion which covers the ulcer remains adherent to it. The cauterization of the ulcer with nitrate of silver, or other agents, is often recommended. Caustic applications add to the destruction of tissue, are extremely painful, and in my experience are not so satisfactory in their results as the use of the iodoform in one of the combinations given above. These powders are entirely painless, are quite inert on the mucous membrane surrounding the ulcer, and are speedy in their action on the diseased surface.

Deep Ulcers of the Larynx in Syphilis.

This form of laryngeal syphilis consists in the development in the mucous membrane of the larynx of an ulcerative process, characterized by the rapidity of its destructive progress, and the depth and extent to which the tissues are involved in its action. It is essentially a tertiary lesion, making its appearance, as a rule, from five to fifteen years after the primary lesion, though occasionally it is met with as early as the fourth or even third year of the disease.

It is probable that most, if not all cases of deep ulceration in syphilis, are due to gummy tumors, for, as we know, these tumors, wherever deposited in the mucous membrane, manifest a tendency toward rapid disintegration and the formation of ulcers, which develop so speedily that it is a comparatively rare occurrence to meet with the gummy tumor before the ulcerative process has set in. This tendency to suppuration in these tumors would naturally be much greater in the larynx than in any other portion of the upper air-passages, hence the opportunity of observing a gummatous deposit in this cavity would probably be an exceedingly rare event. We may say, then, with a considerable degree of positiveness, that these ulcerations are due to the disintegration of gummy tumors. Their usual site is either in the false cords, epiglottis, or ary-epiglottic folds; but, wherever their starting-point may be, their extension is comparatively rapid, and they soon involve the neighboring parts. One peculiarity, however, is noticeable in these ulcers, viz., their tendency to confine themselves to one side of the larynx. This is especially true where their origin is in the false cords; but when involving the arytenoid cartilage or epiglottis, they seem to manifest a hesitancy in extending to the opposite side, though still manifesting their destructive character on the side of the larynx in which they originated. They also show little disposition to extend into neighboring organs, as for instance, they rarely, if ever, extend to the pharynx or œsophagus, when their origin has been in the larynx. They do, however, occasionally extend beyond the epiglottis to the root of the tongue. Having their origin in the larynx itself, they may go on to the complete destruction of the epiglottis, ary-epiglottic folds, the arytenoids, and, in

deed, the whole organ. In Fig. 121 there is shown the ravages of this form of syphilis, as going on to the almost complete destruction of the epiglottis, yet still confining itself to the left ventricular band, without attacking the right side of the laryngeal cavity.

As a matter of clinical observation, we meet with this manifestation of syphilis in the larynx a number of years after the primary lesion, in cases where there have been none of the intermediate stages of the disease. In my experience, in quite a number of cases, the disease, after the primary inoculation, seems to have remained latent through all these years until there crops out, or manifests itself in the larynx, these deep ulcerations under consideration. Why the clinical history of these cases should be so imperfect, and there should be this absence of the secondary stages which, ordinarily, mark the progress and development of the disease, it is difficult to explain; it is merely an observed clinical fact. That there should have been any error of diagnosis, is excluded by the fact that the cases yield kindly and oftentimes brilliantly to the administration of anti-syphilitic treatment. After the ulcerative process has been established, its progress, as has been before stated, is rapid and destructive, involving the mucous membrane and extending to the perichondrium and cartilages which, in turn, disappear under its ravages. A further prominent characteristic of this disease is the great deformity which results from the cicatricial contractions after the healing of the ulcers. This is more marked after this form of ulceration than any other. This, perhaps, may be accounted for by the very great extent of the destruction of tissue, and consequently by the large void which must be closed; and which is filled in the main by the drawing together of the cicatricial tissues, and in part only by granulations. These cicatricial deformities assume shape according to the location and extent of the ulceration. The symmetry of the larynx, which has been already marred by the original ulceration, is still further disturbed by the resultant cicatrix, so that we may have the epiglottis drawn to one side, or down toward the arytenoid cartilages, or the cavity of the organ en-

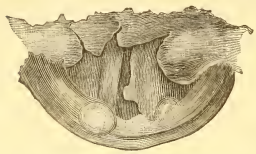

Fig. 121. — The deep ulceration of syphilis, involving the epiglottis and the left ventricular band. (Mackenzie.)

croached upon by bands of cicatricial tissue; in fact, the extent of the deformity to which the larynx may be subjected by these cicatrices is only limited by the extent to which the ulcerative action may destroy. A complete stenosis as the result of these cicatricial contractions is not an infrequent occurrence, to which the only relief that can be given lies in the performance of tracheotomy.

Symptoms.—The onset of this form of syphilis in the larynx is usually sudden and unexpected. The patient in the enjoyment of perfect health, as a rule, suddenly experiences a sense of pain and discomfort referable to the larynx, followed by a more or less hacking cough and impairment of voice—a mere huskiness or slight hoarseness. The pain soon becomes more aggravated, and is a constant source of distress. Difficulty of swallowing, slight at first, soon becomes more marked, and the pain attendant upon the act, of an acute lancinating character. If the disease is located on or involves the arytenoid cartilages or commissure the voice is completely lost, while the pain in swallowing is quite marked, owing to the pressure on the ulcerated surface during the act. If the epiglottis is involved painful deglutition becomes still more prominently a distressing symptom.

In general, it may be stated that impairment of voice and difficulty in swallowing are the two prominent and characteristic symptoms of the affection, the extent to which they are present being dependent on the locality of the ulceration. As the disease progresses these symptoms become somewhat aggravated, and a cough, which at first was but a slight source of discomfort, becomes of a constant and irritating character, due in part to a sensation on the part of the sufferer of a foreign body in the larynx, which it is his constant effort to avoid by hawking and clearing the fauces, and in part, to the profuse discharge of mucus and pus which soon sets in. As the destruction of the tissue progresses, the difficulty of swallowing becomes still more aggravated by the particles of food lodging upon the ulcer or making their way into the air-passages. The protection afforded by the epiglottis and ary-epiglottic folds is, to an extent, lost, their function of affording covering to the larynx being impaired by loss of tissue, by the deformity which results from the ulceration, and also by the impairment of motion.

Diagnosis.—There is no disease of an ulcerative character which presents appearances which can easily be mistaken for the one under consideration, and the diagnosis is comparatively simple, provided that a satisfactory laryngoscopic examination is obtained. Genuine ulcers, once recognized, may be assigned to one of the general dyscrasia before alluded to as alone giving rise to ulcerations of the mucous membranes. In the larynx we meet with superficial ulcers of syphilis, deep-seated ulcers of syphilis, laryngeal phthisis, and epithelioma, each of which present certain characteristic appearances which belong to each individually, and which distinguish the one from the other so decidedly that the diagnosis is made comparatively simple. These will be better appreciated, perhaps, by grouping them in a tabulated form.

Superficial Ulcers of Syphilis.	*Deep Ulcers of Syphilis.*	*Laryngeal Phthisis.*	*Carcinoma.*
Faintly marked areola.	Deep, angry, red, and swollen areola.	No areola.	No areola, but enlarged blood-vessels leading up to ulcerated surface.
Ropy mucus, or muco-purulent discharge.	Purulent discharge mixed with necrotic tissue and débris.	Glairy mucus or muco-purulent discharge.	Muco-purulent discharge.
Scanty discharge.	Very copious discharge.	Scanty discharge.	Moderately profuse discharge.
Grayish-colored surface.	Bright yellow surface.	Grayish surface, often like cut bacon.	Grayish surface dotted with pinkish elevations, often.
Of an oval and somewhat regular outline.	Ragged and irregular outline.	Faintly marked outline, but somewhat regular.	Somewhat jagged outline and everted edge.
Surface not depressed.	Deeply excavated.	Depression of surface not marked.	Surface often raised above surrounding tissues.

Examination.—The appearance of the deep ulcer is characteristic and unmistakable. Its surface is coated with bright yellow pus, mingled with necrosed fibres, and débris resulting from the ulcerative process. Its borders are somewhat jagged, slightly irregular, and overhang the surface of the ulcer, which is depressed and excavated. The mucous membrane surrounding the ulcer is in a state of active and acute inflammation, forming an areola of deeply injected, bright, angry-looking membrane, having all the appearances of a phlegmonous inflammation, but of a somewhat deeper color, verging on a coppery hue. It is swollen and distended, having

something of a glazed appearance, and is covered with a thin, slimy mucus or muco-pus. This coating is oftentimes of a frothy character, and clings closely to the part; this is owing to the fact that the vibratory movement of the ciliæ of the epithelium covering the membrane is destroyed by the inflammatory process, and the ability of the sufferer to void or expectorate it is thereby impaired. This coating, therefore, oftentimes covers and conceals to an extent the morbid process, which can only be recognized after cleansing the parts by means of the spray or other devices.

Treatment.—No form of ulceration in the larynx sets in so suddenly, spreads so rapidly, or involves such extensive destruction of tissue in so comparatively brief a period of time, as the deep ulceration of syphilis, hence its early recognition and prompt treatment become of the utmost importance. Internal medication alone, it is often asserted, is quite sufficient for the arrest of the disease at its onset. This may be true, and yet, where the early accomplishment of this result is of so great moment to the sufferer, it becomes a question whether the greater safety does not lie in the combination of internal and local treatment. During the time consumed in bringing the patient thoroughly under the influence of internal remedies, the destruction of tissue is still going on, and this not infrequently may be days, or even weeks; and even in this time the disease may have so fixed itself upon the part as to become if not entirely incurable, certainly more intractable. Laryngeal syphilis is a disease which may very easily escape beyond our control, hence the importance of its early recognition and early treatment cannot be overestimated. Furthermore, it needs to be combated by every means within our power. In local medication we possess a means, both speedy and efficient, of arresting the further progress of these ulcers, and it should always be employed in connection with internal medication. The constitutional remedy which above all others is efficient, and to which preference should always be given in these deep ulcerations in the larynx, is iodide of potassium, given in full and increasing doses until a decided impression has been made. Commencing with twenty grains, given three times daily, the dose should be increased five grains every third day until marked improvement is noticed in the diseased organ, or the further administration of the drug is interfered with by the production

of iodism, as shown by the eruption on the skin, or the occurrence of coryza or catarrh of the upper air-passages, when the dose, of course, must necessarily be reduced. The administration of mercury alone in this manifestation of syphilis is useless, and it is a waste of time to give it. After the laryngeal disease, however, has been arrested, mercury should be given for a period of from twelve to eighteen months, under the rules which govern its administration for the cure of the constitutional taint.

Local treatment.—The parts should be thoroughly cleansed by the use of the laryngeal spray, directed as closely as possible against the ulcer until all the accumulated pus and necrosed tissue are thoroughly removed from the diseased surfaces. The fluid used may be one of the cleansing solutions given in the Appendix. The spray is best applied with the compressed air apparatus, with a pressure of about twenty pounds.

The efficiency with which the cleansing is done should always be tested by an examination. If an overhanging epiglottis or any other obstacle prevents the use of the spray, the laryngeal probe may be used with a pellet of cotton, or a sponge may be introduced with the sponge-holder, and the cavity of the ulcer wiped out and cleansed, the slight stimulation resulting from this procedure being in no way objectionable. Occasionally it will be found necessary, on account of the amount of the accumulated débris, to make use of the laryngeal syringe shown in Fig. 56. Its beak may be passed over the epiglottis and the cleansing fluid thrown directly into the laryngeal cavity with impunity, the natural contraction of the parts preventing its making its way into the trachea. After the parts are thoroughly cleansed and seen to be so, by inspection with the laryngeal mirror, there should be thrown in by the atomizer a mild astringent to control and correct the catarrhal inflammation of the mucous membrane surrounding the ulcer. For this purpose there may be used tannic acid or sulphate of zinc ten grains to the ounce, chloride of zinc five grains to the ounce, nitrate of silver two grains to the ounce, or, in fact, any simple, unirritating astringent.

After this there should be used iodoform for its specific action on ulceration. This should be combined with morphia, of the strength of two grains of morphia in one drachm of iodoform. It should be thrown directly upon the ulcerated surface

in such a way that it will penetrate as thoroughly as possible, the excavation. This may be accomplished by the powder blower shown in Fig. 47, or perhaps better still, Stoerck's instrument shown in Fig. 48, which can be manipulated with the aid of the mirror, and the deposit localized with more nicety. The success of the application should be noted by examination with the laryngeal mirror, and it should be repeated until such an examination shows that it has been thoroughly done. The use of caustics or any destructive agents in the treatment of these deep ulcerations is rarely if ever indicated, as in the measures above described we have a safe, thoroughly efficient, speedy, and painless method of treatment, which leaves little to be desired. The application of caustics is painful, it adds to the destruction of tissue, produces spasm of the glottis, oftentimes of an alarming character, it is difficult of manipulation, and is rarely confined to the ulcerated surface. It also requires a special skill which, while it should be in the possession of every physician, unfortunately is not. The manipulation necessary to carry out the plan outlined above, on the other hand is possessed by every physician who has mastered the simplest details of laryngoscopy.

In closing the subject of laryngeal syphilis it should be stated that while the classification of the specific manifestations given, is the one which my own observation of a considerable number of these cases has led me to adopt, it is not intended to convey the idea that these conditions all manifest themselves independently, for they do not. We meet not infrequently with cases in which one condition is implanted upon another. The most frequent of these is the occurrence of the superficial ulcer, in connection with the chronic laryngitis of syphilis; less frequently the deep ulceration may be met with in connection with this manifestation.

CHAPTER XIX.

STENOSIS OF THE LARYNX.

In its broader signification, by a stenosis of the larynx may be meant, any morbid condition which encroaches upon the lumen of the cavity, and serves thereby to produce interference with normal respiration. More strictly, however, the term should be confined to that condition in which the narrowing is due to an infiltration of the mucous membrane proper, or the submucous tissues, producing dyspnœa; or to the result of cicatricial contractions. By far the most frequent cause of this condition is syphilis. This disease may cause stenosis, either as the result of the cicatricial contractions which follow the deep tertiary ulceration, or the stenosis may arise as a sequela of that form of syphilis described as the chronic catarrhal laryngitis of syphilis; the morbific products of the disease being deposited in the deep layers of the membrane, and encroaching on the laryngeal cavity, both by the extent of infiltration, and also by the contraction which is liable to ensue as the disease progresses. Other conditions which may cause laryngeal stenosis, are idiopathic or specific perichondritis, or chondritis; or it may be the direct result of injury. That narrowing of the upper air-passages, which may be the result of pressure by aneurism, carcinoma, fibroid tumors, enlarged glands, etc., does not properly belong to genuine stenosis of the larynx.

The symptoms resulting from this condition, aside from those due to the disease which causes it, are all embraced under the one symptom of dyspnœa. From a moderate shortness of breath, not particularly noticeable, there gradually develops, by a progress oftentimes so slow as to consume months in making itself prominent, a dyspnœa which sooner or later will demand tracheotomy unless relief can be afforded by other means.

As an almost invariable rule, no measures of internal medication are of any avail in arresting the progress of the stenosis, after the morbid process which causes it has once set in. Especially is this true if the disease be due to cicatrization following the deep ulcers of syphilis, or to the non-ulcerative tertiary form of the constitutional taint. As the disease progresses, therefore, and the dyspnœa becomes marked, it will become absolutely necessary to open the trachea. The difficulties in the way of the treatment of the condition are very greatly increased, unless tracheotomy has been previously performed, hence the operation, even if not demanded by the urgency of the symptoms, is justified on this ground alone. Furthermore, the total rest and quiet afforded to the larynx by opening the trachea, will very materially aid the success of measures resorted to for remedying the stenosis.

Treatment.—The treatment of laryngeal stenosis is not unlike that of urethral stricture, being only modified by the differing anatomical and physiological characteristics of the organ. Among the measures resorted to for its relief we have gradual dilatation, forcible dilatation, and the cutting dilator. Corresponding to the ordinary urethral sound, the forcible dilator and the urethrotome.

Occasionally attempts have been made to dilate a stenosed larynx before tracheotomy has been performed, making use of hollow tubes or bougies; as a rule, however, the treatment is carried out after the introduction of a canula.

Schroetter, of Vienna, has reported a number of successful cases in which the stenosis was permanently overcome by gradual dilatation, by means of a series of metallic bougies, of a somewhat triangular shape, about one and a half inch in length, and varying in diameter from one-fourth of an inch to two-thirds of an inch, there being twenty-four sizes. Each bougie has a small opening through it from end to end. Into this opening fits a slender rod, slightly longer than the bougie. The upper end of the rod has an eye into which is fastened a cord, while the lower end is expanded into a small knob. The patient having undergone such training, by the daily introduction of a probe into the larynx, as will enable him to tolerate the passage of the bougie, the plan of procedure is as follows: The bougie is passed into the larynx by means of a bent canula, mounted in a handle, as shown in Fig. 122. The cord attached

to the bougie is drawn through the canula and fastened at the extremity of the handle. The bougie having been passed into the larynx, the knob on the lower end of the rod passing through its centre, emerges in the tracheal canula, through a fenestrum in its upper surface, where it is seized and held by a small pair of spring forceps inserted through the cervical end of the canula. The bent canula is now withdrawn, leaving the cord protruding from the mouth. The cord can now be se-

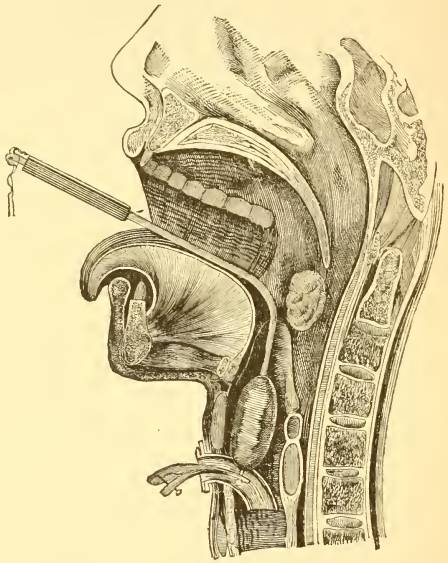

FIG. 122.—Schroetter's laryngeal dilator in situ. (Labus.) From Cohen.

cured by tying around the neck, and the bougie left in place for a length of time, varying with the tolerance of the patient. At the commencement of treatment this will be perhaps not longer than a half hour, but as the parts become tolerant it may be left in place a day, or longer, and need only be removed for purposes of cleansing. When it is desired to remove the bougie, the spring forceps are unclasped, when it can easily be drawn out by means of the cord.

Schroetter has modified this instrument, somewhat, by sub-

stituting for the spring forceps by which the bougie is held in place, the inner canula of the trachea tube, as shown in Fig. 123.

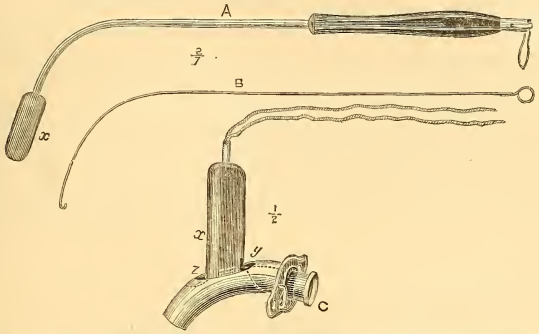

FIG. 123.—Schroetter's modified laryngeal dilator. (Mackenzie.) A, the handle with bougie attached, ready for passing into the larynx; B, a slender rod for drawing the cord through the handle. The bougie x having been passed through the fenestrum in the tracheal canula, is held in place by the inner canula C, which passes through a canal in the lower extremity of the bougie.

The process detailed above is necessarily a very slow one. In order to hasten somewhat the progress of the cure a num-

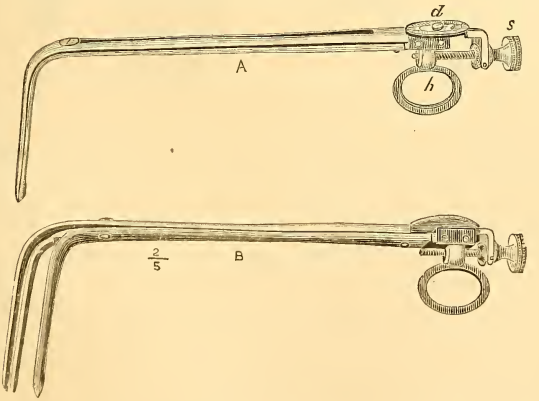

FIG. 124.—Mackenzie's laryngeal dilator: A, the instrument closed; *d*, dial; *s*, screw; B, the instrument open.

ber of instruments have been devised for the forcible dilatation of the stenosis. These are intended, mainly, for use in connec-

tion with the bougies, as after the use of the dilator the bougie is necessarily introduced in order to prevent the contraction which would ensue, unless this were done.

In Fig. 124 is shown Mackenzie's dilator which consists of three blades, bent at the proper angle for introduction into the larynx, and operated by means of a screw at the proximal end. The instrument is introduced into the larynx, while closed, when the blades are opened by turning the screw. The amount of distention accomplished is shown by an index and dial plate on the handle.

A somewhat ingenious device on the same plan is shown in Fig. 125. This is the dilator of Navratil. It consists of a long

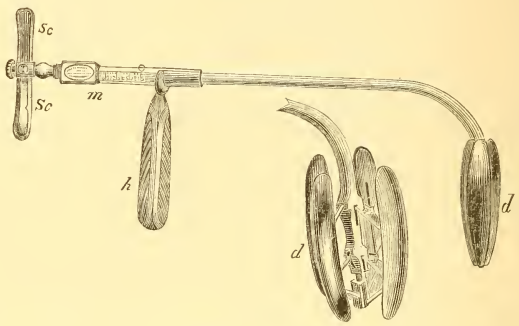

FIG. 125.—Navratil's laryngeal dilator. (Mackenzie.)

metallic tube bent at a laryngeal curve and containing within it a steel rod. On the distal end of the instrument is mounted an olive-shaped bougie (*d*), composed of four segments. These segments are attached by movable arms, in part to the outer tube and in part to the central steel rod. *Sc* is a screw at the proximal end, and at *h* is a handle by which the patient holds the instrument. By turning the screw the central steel rod is drawn within the outer tube, bringing forward the movable arms, and expanding the segments as shown in *d*. At *m* is a scale which indicates the extent of the dilatation.

In Fig. 126 there is illustrated still another device for overcoming a laryngeal stenosis, which consists of the combination of a dilator with a cutting instrument. Of course it is by no means a difficult manipulation to incise a laryngeal contraction

by means of any of the ordinary laryngeal knives. The advantage of the instrument shown is in putting the tissues on the stretch before they are incised, which renders the cutting more thorough. This instrument is the design of Dr. Whistler, of London, and consists of an olive-shaped bougie, containing a concealed knife which is only protruded when desired. The instrument is so arranged that the knife may be made to protrude anteriorly or posteriorly.

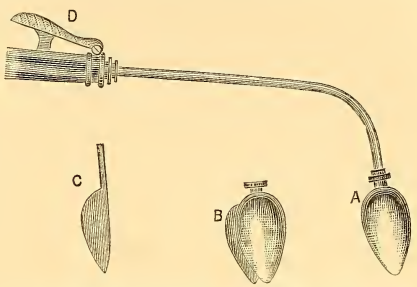

FIG. 126.—Whistler's cutting laryngeal dilator: A, bougie with knife concealed; B, blade protruding; C, knife detached; D, spring by means of which the blade is made to project.

The treatment of laryngeal stenosis by means of any of the above-mentioned plans is necessarily tedious and protracted, involving, as a rule, a course extending over from twelve to eighteen months. Yet, when we consider the alternatives presented to the sufferer, of submitting on the one hand to this tedious process, and on the other hand the terrible prospect of wearing a tracheal tube during life, it would seem that there should be no question as to the advisability of the treatment, provided that it offers any certainty as to the ultimate cure. Unfortunately, this cannot be assured. Schroetter has reported and exhibited a number of cases in which the gradual dilatation by his bougies has resulted apparently in a perfect and permanent cure. On the other hand it should be stated that others have not usually obtained the same uniform success in their efforts.

Of the various devices described, I should give the preference decidedly to the bougies of Schroetter. I see no reason to reject the analogy between a urethral and a laryngeal stricture already alluded to. The pathological condition is certainly very similar in the two diseases, however marked the difference in function may be. In urethral stricture, after fair trial of the rapid dilatation by rupture and also by cutting, the weight of opinion seems to be reverting to the old plan of gradual dilatation. It is a fair inference that the same method will prove

more permanently beneficial in the larynx. In those cases in which there may exist fibrous bands or webs, it will, of course, be well to use Whistler's cutting dilator, although in many cases the simple knife or galvano-cautery knife may be used.

Another plan, that may be very briefly mentioned, for overcoming a laryngeal stenosis, consists in the performance of thyrotomy, by which the laryngeal cavity is opened from without, and the offending tissue dissected out. This operation necessarily involves the destruction of the special organ necessary for the production of the voice, but these are destroyed already by the disease which has caused the stenosis.

CHAPTER XX.

NEUROSES OF THE LARYNX.

General Considerations.—The larynx receives its innervation from the superior laryngeal and inferior laryngeal branches of the pneumogastric nerve (see Fig. 127). The motor fibres,

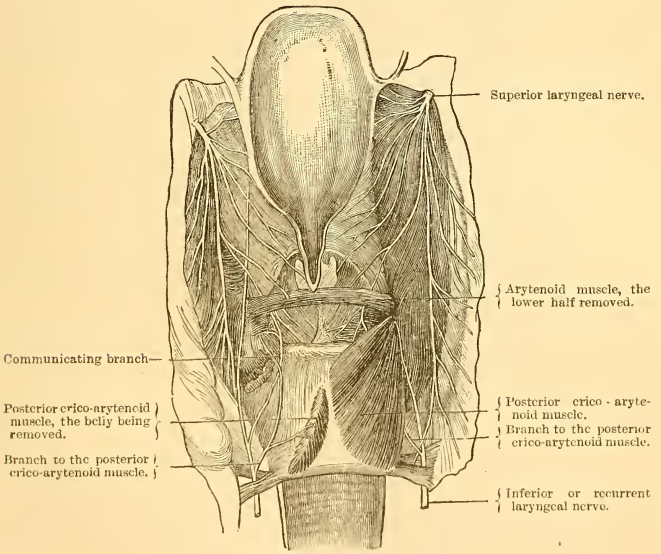
Superior laryngeal nerve.
Arytenoid muscle, the lower half removed.
Communicating branch—
Posterior crico-arytenoid muscle, the belly being removed.
Branch to the posterior crico-arytenoid muscle.
Posterior crico-arytenoid muscle.
Branch to the posterior crico-arytenoid muscle.
Inferior or recurrent laryngeal nerve.

Fig. 127.—The laryngeal nerves. (Luschka.)

however, have their origin in the spinal accessory nerve, while sensation alone is supplied by the pneumogastric.

The superior laryngeal nerve arises from the inferior ganglion of the pneumogastric, and passes down behind the in-

ternal carotid artery to the side of the pharynx, where it divides into two branches; the external branch passing down to supply the crico-thyroid muscle, while the internal branch pierces the thyro-hyoid membrane, and is distributed to the mucous membrane of the larynx and to the arytenoid muscle. It is in the main a nerve of sensation.

The inferior or recurrent laryngeal nerve is in the main a nerve of motion. Its course varies on the two sides of the

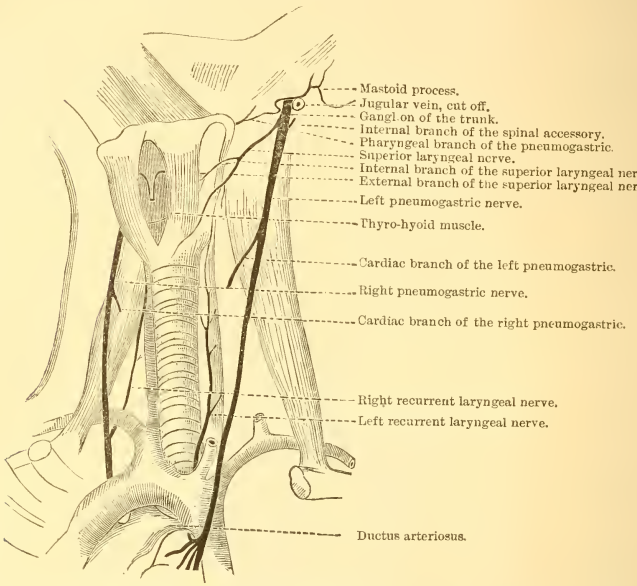
Mastoid process.
Jugular vein, cut off.
Ganglion of the trunk.
Internal branch of the spinal accessory.
Pharyngeal branch of the pneumogastric.
Superior laryngeal nerve.
Internal branch of the superior laryngeal nerve.
External branch of the superior laryngeal nerve.
Left pneumogastric nerve.
Thyro-hyoid muscle.
Cardiac branch of the left pneumogastric.
Right pneumogastric nerve.
Cardiac branch of the right pneumogastric.
Right recurrent laryngeal nerve.
Left recurrent laryngeal nerve.
Ductus arteriosus.

FIG. 128.—The laryngeal branches of the pneumogastric nerve in the newly born child. (Henle.)

body in a manner which becomes of importance in a pathological point of view, owing to the fact that, while on the right side it arises in front of the subclavian artery, on the left side it arises in front of the arch of the aorta. After passing from above downward and backward around these vessels, the nerves on both sides generally pass to the side of the trachea and ascending in the sulcus between the œsophagus and trachea, enter the larynx behind the articulation of the

inferior cornua of the thyroid cartilage with the cricoid. They supply motor filaments to all the muscles of the larynx except the crico-thyroid. A reference to Fig. 128 will show this variation in the course of the nerves of the two sides, while in Fig. 129 a transverse section of the neck is given, which indicates more clearly the position of the left recurrent nerve, bending forward in a somewhat more exposed position than its fellow of the opposite side. The recurrent nerve also sends off a num-

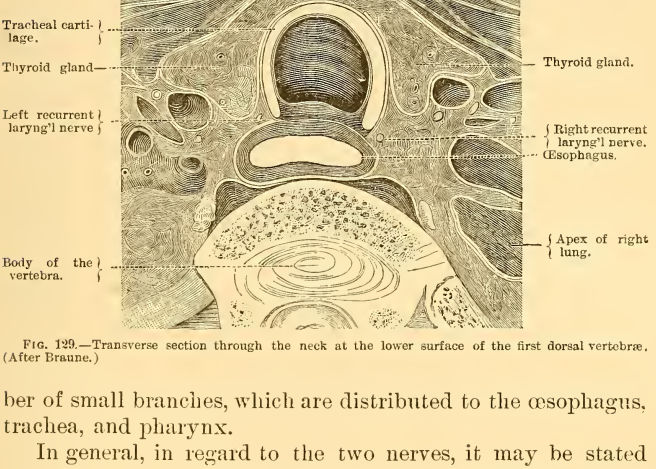

FIG. 129.—Transverse section through the neck at the lower surface of the first dorsal vertebræ. (After Braune.)

ber of small branches, which are distributed to the œsophagus, trachea, and pharynx.

In general, in regard to the two nerves, it may be stated that the superior laryngeal nerve supplies sensation to the mucous membrane lining the larynx down to the level of the vocal cords, with motor filaments to the crico-thyroid muscle, and possibly motor filaments to the arytenoideus and thyro-epiglottidean muscles. This, however, is still an unsettled question, and being so, we may adopt the view that the crico-thyroid muscle is the only one which receives its innervation from the superior laryngeal nerve.

The recurrent laryngeal nerve supplies motor filaments to all the muscles of the larynx, except the crico-thyroid, and also supplies sensation to the mucous membrane of the trachea as far up as the edge of the vocal cords.

It has been usual to make a classification of neuroses of the larynx, based mainly on the above anatomical considerations. Whether this be the true method of classification is certainly open to question, as it would lead to the description of diseases which we probably never meet with clinically.

Anæsthesia, hyperæsthesia, paræsthesia, and neuralgia of the larynx undoubtedly may exist to a more or less well-marked extent, but whether they occur as separate and distinct affections, and are entitled to consideration as such, is certainly an open question. In approaching death, for instance, anæsthesia of the larynx occurs, but it is simply in connection with the failure of all the powers. Hyperæsthesia of the larynx occurs in laryngeal phthisis, but it is merely a symptom of that disease; the same may be said in regard to the engorgement which accompanies the existence of tumors or ulcerations. That paralysis, due to any morbid condition of the superior laryngeal nerve, such as neuritis, pressure of tumors, diphtheria, etc., will produce loss of sensation in the parts to which the nerve is distributed is undoubtedly true; but so long as this disease is described as one which might possibly occur rather than one which has been clinically observed, it would seem that its introduction into a treatise on these affections would be something of a refinement in classification. The genuine neuroses which we meet with in the larynx are those due to defective innervation through the recurrent laryngeal nerve; in this connection, however, reference will be made to paralysis of the individual muscles.

These subjects will be discussed under the following heads:

Unilateral recurrent laryngeal paralysis.
Bilateral recurrent laryngeal paralysis.
Unilateral paralysis of the crico-arytenoideus posticus muscle.
Bilateral paralysis of the crico-arytenoideus posticus muscles.
Unilateral paralysis of the crico-arytenoideus lateralis muscle.
Bilateral paralysis of the crico-arytenoidei laterales muscles.
Unilateral paralysis of the thyro-arytenoideus muscle.
Bilateral paralysis of the thyro-arytenoidei muscles.
Paralysis of the arytenoideus muscle.

Recurrent Laryngeal Paralysis.

This is a paralysis of all the parts supplied by this nerve due to some morbid condition of the nerve-centre or the nerve-trunk. In the majority of cases this consists in pressure upon the nerve, though occasionally a diseased condition of the nerve-trunk or nerve-centre may be the source of the paralysis. Among the conditions which may produce this disease, are apoplexy, softening of the brain, etc., but, as a rule, the source of the trouble is in some injury to the nerve-trunk itself. On the right side it will be remembered that the nerve passes around the subclavian artery, while on the left side it passes around the arch of the aorta, and in its course to the larynx lies somewhat nearer to the surface. It is therefore more exposed to injury and to pressure. As a matter of clinical fact, paralysis of the left recurrent nerve is of far more frequent occurrence than paralysis of the right; indeed, I have never met with but one case of paralysis of the right recurrent nerve, while I have recorded some twenty-five cases of left recurrent paralysis. Among the conditions which produce the disease are enumerated, aneurism, carcinoma, bronchocele, enlarged bronchial glands, rheumatic affections, the various forms of tumors which may occur in the neck, indurations at the apex of the right lung, and in fact any condition which may produce pressure on the nerve-trunk, and thereby, interruption of the nerve-current. Perhaps the most frequent of all causes is aneurism of the arch of the aorta.

Next in frequency, as a cause of the affection, is syphilis, without assigning any especial manifestation of the disease as producing the paralysis. Of the twenty-five cases above mentioned, most of which have presented at the Bellevue Throat Clinic in the last eight years, six have been due to discoverable aneurism, four to probable aneurism, four to enlarged bronchial glands, two to cancer of the œsophagus, six to syphilis, and in three there was no discoverable cause; one of these was a young girl of seventeen. In the one case in which the affection occurred on the right side, it was due to pressure on the nerve-trunk by the induration of incipient phthisis of the right lung.

Symptoms.—The symptoms pointing to this affection are

not prominent or distinctive. Occasionally cases are met with in which no symptoms whatever are present, more than a slight and almost imperceptible impairment of the ordinary voice. At other times the voice may be seriously impaired, its register markedly lowered, and talking accomplished with more or less effort, the voice being weak and tiring easily. Cough may be present, but due usually to a catarrhal laryngitis which develops, as the result of overtaxing the muscles of phonation, weakened by the paralysis. This consists in a straining of the muscles of one side to counterbalance the paralysis of the opposite side. Breathing is rarely, if ever, interfered with, and dyspnœa due to the paralysis itself never occurs, although it may occur as a symptom of the disease which produces the paralysis, such as aneurism, tumors, etc.

There may be a considerable degree of irritation in the laryngeal membrane, due to the venous congestion caused by the interference with the return circulation, on account of the aneurism or tumor which is the source of the paralysis. This irritation may be the source of no little annoyance and even distress to the sufferer, the obstructive congestion leading soon to a low form of chronic catarrh of the larynx, attended with considerable swelling of the parts with the secretion of a thick, ropy, tenacious mucus, which is expectorated with considerable difficulty. In these cases the voice is apt to be seriously impaired, assuming a thick, husky character. It is also, at times, of a somewhat higher pitch, verging on the falsetto tones, especially at the onset of the paralysis. Cough, also, in these cases, becomes quite a prominent symptom of the affection, due, mainly, to the laryngeal catarrh.

Examination.—An examination of the larynx will reveal the condition unmistakably. In making an observation, however, it is of importance that the laryngeal mirror should be exactly in the median line, and that a perfectly symmetrical image should be obtained, as a distorted or unsymmetrical image will prove very deceptive, and oftentimes fail to reveal a lack of motility which may exist. A symmetrical view having been obtained, it will be seen that one of the cords lies half way between extreme adduction and abduction (see Figs. 130—131), that is in the so-called cadaveric position. This, of course, is the position which the cord would naturally be supposed to assume when entirely free from any

muscular control, as it is in this form of paralysis. This position of rest in the cadaveric position remains during phonation and inspiration. But during phonation it will be seen that the arytenoid cartilage does not remain motionless, as a rule, but at the commencement of the act it will on close observation be noticed that it is tilted or drawn spasmodically, as it were, toward its fellow of the opposite side. This is explained by the fact that the arytenoideus muscle, being supplied by the recurrent nerve of each side, is not paralyzed with the other muscles, but receives sufficient innervation from the unaffected nerve to act still on the arytenoid cartilage of the opposite side. During the act of phonation it will also be noticed that the cords are fairly approximated. This is accomplished by the increased action of the adductor muscle of the sound side of the larynx, carrying the cord to the median line and beyond it

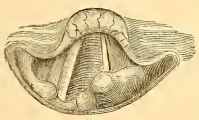

FIG. 130.

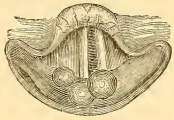

FIG. 131.

FIG. 130.—Right recurrent paralysis; position of the cords in inspiration. (Mackenzie.)
FIG. 131.—Right recurrent paralysis; position of the cords in phonation. (Mackenzie.)

in such a manner that it is still brought into approximation with its fellow of the paralyzed side sufficiently close for phonation, moving in the larger arc of a circle than normally. Another characteristic appearance of recurrent laryngeal paralysis is noticed, namely, that the arytenoid cartilage of the mobile side swings in front of the arytenoid of the paralyzed side. This condition will be understood by reference to Fig. 131, which will show the deviation from the antero-posterior line of the opening between the vocal cords during phonation, and also the characteristic position of the arytenoid cartilages. In addition to this, it will be noticed that the cord of the paralyzed side, during the act of phonation, instead of coming up into perfect parallelism with its fellow of the opposite side, assumes a bowed condition due to the paralysis of tension of the cord, as the result of which it becomes relaxed in this act. It yields before the pressure of the column of air, and assumes the position above mentioned.

We thus have, as the result of paralysis of the recurrent nerve, a paralysis of abduction, adduction, and tension of one side of the larynx, which in combination produce the condition above described.

Diagnosis.—The only condition with which the affection under consideration may be confused is that of unilateral paralysis of the crico-arytenoideus posticus muscle, or of abduction. In this latter affection, however, the paralyzed cord lies exactly in the median line, in contradistinction with the cadaveric position of the cord in recurrent laryngeal paralysis. There is no paralysis of tension, and the arytenoid cartilages remain perfectly in line during phonation. A close inspection should always enable the observer to recognize the characteristic difference between these two conditions.

With paralysis of the abductor of the cord, the crico-arytenoideus lateralis muscle, the affection under consideration might be confounded, but in this form of paralysis the vocal cord lies in a state of extreme abduction, in contradistinction with the cadaveric position of the cord in recurrent laryngeal paralysis. In addition to this it will be noticed, on inspection, that in the attempt at phonation the cords are not approximated, but that the mobile cord is drawn only to the median line or possibly somewhat beyond it, but is not drawn far enough to meet its fellow of the opposite side. The symptoms of the two affections, also, are different, in that the voice is lost in paralysis of adduction, while in recurrent laryngeal paralysis it is but moderately impaired.

Double Recurrent Laryngeal Paralysis.

This is an extremely rare affection, but is occasionally met with as the result of the same causes, which may produce it on one side, acting on the recurrent laryngeal nerves of both sides. The cases reported of this affection have been due to cancer of the œsophagus and aneurism of the arch of the aorta, extending sufficiently to produce pressure on both nerve-trunks. The result of paralysis of both nerves is of course complete paralysis of all the muscles of the larynx with the exception of the crico-thyroid, whereby the functions of tension, abduction, and adduction of the cords are entirely de-

stroyed and the larynx assumes the position before spoken of as the cadaveric position (see Fig. 132). The symptoms which characterize this affection are, in the main, complete loss of voice, with inability to cough. The loss of voice is explained, of course, by the immobility of the cords and their failure to approximate. The inability to cough is due to the ablation of a very important element in the mechanism of coughing, namely, the spasmodic closure of the cords, which precedes the rush of expired air which carries with it the secretions which it is the effort of the cough to remove. There is also present what has been termed a phonative dyspnœa, namely, a loss of breath resulting from the abortive effort at phonation. The diagnosis is, of course, quite simple, and there is no other condition with which it can be easily confounded. The only affection which it resembles is bilateral paralysis of the adductors, namely, the crico-arytenoidei laterales muscles. In this latter affection, which is an extremely rare one, the cords lie in a state of extreme abduction, which on an ordinary careful examination should not be mistaken for the midway position which the cords assume in the disease under consideration.

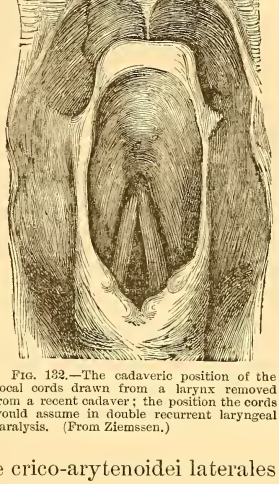

FIG. 132.—The cadaveric position of the vocal cords drawn from a larynx removed from a recent cadaver; the position the cords would assume in double recurrent laryngeal paralysis. (From Ziemssen.)

PARALYSIS OF INDIVIDUAL MUSCLES.

While not necessarily neuroses in the strict sense of the term, it is generally the practice to consider paralyses of the individual muscles of the larynx under the same heading as those of neuropathic origin. The affections already treated of are true neurotic affections of the larynx, while in paralysis of the individual muscles we must look for the source of the disease in the muscles themselves. Without entering into a lengthy

discussion of the true pathology of these cases, it is sufficient to say that while the investigations heretofore made, throw comparatively little light upon it, the burden of the testimony seems to point to the conclusion that the seat of the disease lies in the muscle itself, in some nutritive or degenerative changes by which its contractility is destroyed and consequently its function abolished. The usual changes reported in those cases which have been examined are successively a proliferation of nuclei, fatty degeneration, and atrophy. The question would still remain open, whether these changes result from impairment of nerve supply, or that the pathological change occurs primarily in the muscle itself. As more completely harmonizing with clinical observations, and affording a clearer and more definite conception of the cause and course of these muscular paralyses of the larynx, it seems fair to adopt the conclusion that they are due, primarily, to certain changes having their inception in the muscles themselves. The muscles of the larynx are in a state of constant activity, more so, perhaps, than any other muscles of the body. They are liable to constant strain or over-use. They lie in contact with a mucous membrane which is extremely liable to be the seat of inflammatory action, which in a large proportion of cases becomes to an extent permanent, in the form of a chronic catarrhal inflammation. The muscles which lie in most intimate apposition with the mucous membrane of the larynx, and which are liable to most abuse in strained and prolonged use in talking, are probably the tensors, namely, the thyro-arytenoid muscles, and, as is the case, it is these muscles which we would naturally suppose would become most frequently subject to impairment of function. In a large proportion of cases of chronic catarrhal laryngitis, we find that it is complicated with more or less impairment of tension, as shown in the so-called elliptical paralysis of one or both sides.

And so of any of the paralyses of single muscles, it is easier to explain their occurrence, by morbid processes occurring within the muscles themselves, than to suppose it possible that the individual fibres of the recurrent laryngeal nerves, which are distributed to a single muscle, could be paralyzed to the exclusion of the others. Certainly it is difficult to suppose that any pressure exercised on the nerve-trunk could so impair the conductivity of the fibres leading to a single muscle, as to

destroy its function while the other fibres of the nerve remain intact. Nor, on the other hand, is it to be believed that any essential disease in the nerve-trunk itself could so differentiate the fibres as to select for destruction only those belonging to a single individual muscle.

Unilateral Paralysis of the Crico-Arytenoideus Posticus Muscle.

This muscle, arising from the posterior surface and sides of the cricoid cartilage, is inserted into the external angle of the base of the arytenoid cartilage.

Its contraction draws the outer angle of the arytenoid backward, rotating the anterior angle of the cartilage, to which is attached the vocal cord outward, thus opening the glottis. The performance of this function, depends entirely on this muscle. In paralysis its function, as a glottis opener, is abolished, and the vocal cord falls into the median line. In paralysis of the muscle of one side alone the symptoms are not prominent, nor is the condition necessarily a grave one; but where both the muscles are paralyzed, as already stated, the condition is attended with the greatest possible danger to life. The subjective symptoms of unilateral paralysis of this muscle present no features which, as a rule, would even call attention to the larynx, unless, as is usually the case, there be a laryngeal catarrh, when, of course, the symptoms would point to that affection rather than to the paralysis. There is no dyspnœa, the voice is not affected, adduction and tension upon which normal phonation depends being not markedly impaired, although tension of the cord may be slightly interfered with from the abolition of that function of the paralyzed muscle, which consists in its holding the arytenoid cartilage firmly in place, affording a fixed point for the contraction of the thyro-arytenoideus—the tensor muscle of the cord. The glottis is somewhat narrowed, hence in labored breathing, resulting from any exertion, there may be a slight stridor on inspiration; as a rule, however, this is not noticed.

On examination of the larynx in this condition the cord of the paralyzed side will be noticed to lie quietly and at rest in the median line, while its fellow of the opposite side moves

with the acts of inspiration and phonation throughout its normal arc. While the cord, however, lies motionless, the arytenoid cartilage itself will be noticed with each act of phonation to tilt somewhat toward its fellow of the opposite side under the action of the arytenoideus muscle.

The appearance of the larynx in this condition, in the act of inspiration, will be seen as above. The position of the cords in the act of phonation will, of course, be normal. The only condition with which it is liable to be confounded is that of recurrent laryngeal paralysis. Careful examination, however, will reveal the characteristic differences between the two affections. The prominent distinctive feature being, that in the affection under consideration the cord lies in the median line, while in the other it assumes the cadaveric position. While not essentially a grave condition in itself, it is probable that in many cases the paralysis of one muscle may be a forerunner or warning that the other muscle may become affected, in which case the affection becomes one of the greatest gravity. It is not intended to give the impression that unilateral paralysis, as a rule, precedes bilateral, but that this may be the occasional sequence of events has come within the writer's personal observation.

In the very large proportion of cases this form of paralysis in the larynx is due to syphilis. Occasionally it is met with in laryngeal phthisis, and also in cancer of the larynx. In these cases the direct local action of the source of the paralysis is easily traced, in either pressure upon or infiltration of the muscular tissue, and thereby the destruction of its functional activity.

Bilateral Paralysis of the Crico-Arytenoidei Postici Muscles.

This disease presents so many points of extreme interest that I prefer to devote a separate chapter to its fuller consideration. I regard it as differing in its pathology from those we are now considering, in that it is not always purely of a myopathic origin, but is rather of a central origin. For this reason, therefore, its consideration is best deferred.

Unilateral Paralysis of the Crico-Arytenoideus Lateralis Muscle.

This is an extremely rare affection, and in the few cases reported there seems to be an element of doubt as to the correctness of diagnosis. That it may occur, however, is undoubtedly true. The function of this muscle being to draw the vocal cord toward the median line, the effect of its paralysis would be that the cord would lie motionless in a state of extreme abduction, that is, against the lateral wall of the larynx. As a result of this, and the consequent inability of its fellow to approach it for the purpose of phonation, the voice would be lost, otherwise the symptoms would not be prominent. There would be no dyspnœa, other than something of the expiratory dyspnœa already referred to, with a partial inability to cough. An examination will show the condition above described. The condition with which it may be confused is that of recurrent laryngeal paralysis; the prominent point of distinction between the two affections is in the extent to which the paralyzed cord is abducted. In addition to this there is paralysis of tension, which does not exist in the affection under consideration. The voice is, as a rule, lost in this affection, while but moderately impaired in the recurrent laryngeal paralysis.

Bilateral Paralysis of the Crico-Arytenoidei Laterales Muscles.

In this affection, both adductor muscles of the cord being paralyzed, the cords lie in a state of extreme abduction, namely, against the sides of the thyroid cartilages. The glottis thus becomes widely opened, the voice is lost completely, the ability to cough is destroyed, and the expiratory dyspnœa above alluded to becomes a prominent symptom of the affection. It is an extremely rare disease, but easily recognized from the position of the cords, which on inspection will be seen assuming the position of extreme abduction. The only affection with which it may be confounded is that of double paralysis of the recurrent laryngeal nerves, and spasm of the abductors, if such an affection ever occurs, which is extremely doubtful.

What was said in regard to the differential diagnosis in connection with the unilateral paralysis of this muscle applies equally well to the bilateral affection.

Bilateral Paralysis of the Thyro-Arytenoidei Muscles.

This disease is sometimes spoken of as simple paralysis of the tensors, and also elliptical paralysis of the cords. It is still apparently an open question what the true function of this muscle is, some writers regarding it as a laxator muscle, in that its contraction diminishes the distance between the arytenoid cartilage and the receding angle of the thyroid. What possible end could be subserved, by the accomplishment of this act of relaxing the vocal cords, I never have been able to comprehend. Simple relaxation of muscular effort will accomplish all that is desired in this direction, while the idea that muscular contraction need be brought into play to relax the vocal cord, so far complicates the problem of the true function of the laryngeal muscles that it seems to me that it had best be abandoned. The true function of the thyro-arytenoid muscle is that of a tensor of the cord. The principle on which it acts is best shown by the homely illustration of a rope stretched between two fixed points; if it be wetted the fibres become swollen and laterally distended, thus stretching the rope more tensely. The nerve-current acts upon the fibres of the thyro-arytenoid muscle in exactly the same manner as the water upon the stretched rope. It should be remembered, of course, that this muscle is stretched between two fixed points, for although the arytenoid cartilages are movable, they are rendered to a great extent motionless in the act of phonation by the contraction of the crico-arytenoidei postici muscles. The anterior insertion of the muscle in the receding angle of the thyroid cartilage is, of course, a fixed point. The true function of the thyro-arytenoideus muscle, then, is that of a tensor of the cords, and under its action the cord is endowed with the property of a wide range of vibrations which gives it the power of regulating the pitch of the voice.

Owing to the intimate relation between the mucous membrane lining the larynx and the thyro-arytenoideus muscle, it

is extremely liable to have its function impaired by any inflammation which involves the laryngeal membrane, so that a not infrequent cause of impairment of function, assuming the form of a paresis or paralysis of this muscle, lies in a chronic laryngeal catarrh.

Another frequent source of trouble lies in overstraining by prolonged use of the voice or a too labored attempt at maintaining it at high tension. Paralysis of tension occurs in connection with recurrent laryngeal paralysis, and may also be indirectly a result of impairment of the general health as in anæmia, etc.

The symptoms of this affection consist mainly in impairment of the voice, according to the extent to which the muscle is affected. This may be simple lowering of register and slight huskiness of the voice, but never aphonia. The ability to strike the high notes is lost, and the voice also becomes extremely weak, and the sufferer unable to endure any prolonged use of it, it tires easily. In extreme cases there is a peculiar hesitancy in the voice, especially in the utterance of the aspirates, such as *house*, etc. In attempting these words the sufferer will make several futile efforts before he is able to bring out the clear note; this may amount occasionally to almost a stuttering voice. The cause of this is very simple—the result of the paralysis of the tensors is, that while the arytenoids are approximated and the cords brought into apposition for phonation, the instant that the current of air from below impinges upon the under surface of the cords to force itself between the narrow chink in order to throw them into vibrations, it finds them in such a flaccid and relaxed condition that they bulge out and open, allowing the air to escape through the elliptical aperture thus made without being thrown into phonative vibrations, and it is only after several ineffectual efforts that they become sufficiently tense to give forth the desired sound. An examination with the laryngeal mirror shows this condition of things very clearly. The mirror being in position the patient should be directed to phonate, when, instead of the straight and narrow chink of the glottis with the cords in a parallel position, they will be bowed out, leaving an elliptical opening between them. This appearance is easily recognized and characteristic. The position which the cords assume is shown in Fig. 133. This elliptical opening extends the full length of the vocal cords. One would

suppose that under the action of the adductor muscles the vocal processes of the arytenoid cartilages would be brought into apposition, and that this relaxation would only be shown extending from these processes to the anterior insertion of the cords. As a matter of clinical observation, however, the relaxation seems to extend the whole length of the cords, from which we might infer that the action of the thyro-arytenoid muscle, as well as the crico-arytenoideus lateralis, is essential in bringing the vocal cords into parallelism, and that while the former muscle rotates the arytenoid cartilage on its axis, and brings the vocal process toward the median line, the contraction of the latter muscle is necessary to bring the cords into perfect parallelism.

FIG. 133.—Position of the cords in paralysis of the thyro-arytenoideus muscle, or elliptical paralysis. (From Mackenzie.)

UNILATERAL PARALYSIS OF THE THYRO-ARYTENOID MUSCLE.

From what has been said before in regard to double paralysis of the tensor muscles, little need be said in regard to paralysis of the single muscle. This not infrequently occurs on one side of the larynx as a result of local causes, or, as has been stated above in connection with the paralysis of the other muscles, in recurrent laryngeal paralysis.

The symptoms would be much the same, only in a less degree, as those which accompany the bilateral affection. The condition is easily recognized, the cord of the paralyzed side bowing out in the manner above described, while on the mobile side of the larynx the cord assumes its normal position in phonation.

PARALYSIS OF THE ARYTENOIDEUS MUSCLE.

Owing to its exposed situation, and from the fact that the arytenoid commissure is the frequent seat of catarrhal affections, ulcers, etc., one would suppose that the arytenoideus muscle would be the frequent seat of paresis or paralysis. As a matter of actual observation, however, it is extremely rare.

When occurring it is due to a catarrhal affection, generally of an acute character. The function of this muscle being to approximate the arytenoid cartilages, its paralysis necessarily abolishes this function while the adduction of the cords is still accomplished by the action of the crico-arytenoidei laterales muscles. As a result of this, when the cartilages are rotated, their vocal processes are brought into apposition, and the cords into parallelism from these processes to their anterior insertion; but the cartilages not being approximated, a triangular opening is left posteriorly between them, as shown in Fig. 134. Hence, in the act of phonation, while the anterior two-thirds of the cords are thrown into vibration, the air escapes through this triangular opening; the voice becomes hoarse, lowered in pitch, and phonation is accomplished with considerable effort, the voice soon tiring. Paralysis of the arytenoid muscle should not be confounded with those causes which produce mechanical interference with the approximation of the cartilages, such as glandular infiltration, thickening of the arytenoid commissure, as in the first stage of laryngeal phthisis, the presence of tumors, ulcerations, etc. A careful examination will always reveal the presence of these conditions, and a mistake in diagnosis need not occur.

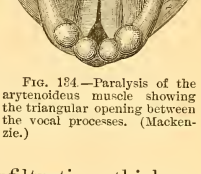

FIG. 134.—Paralysis of the arytenoideus muscle showing the triangular opening between the vocal processes. (Mackenzie.)

TREATMENT OF PARALYSIS IN GENERAL.

As regards the treatment of those affections which depend upon defective innervation from pressure or other causes, such as recurrent laryngeal paralysis, it is of importance that the origin of the disease should be recognized and treated, as of course there is no especial indication for local treatment in the larynx if an aneurism or cancer is pressing on the recurrent nerve. In these cases the principal value of the recognition of the laryngeal affection lies in the aid which it gives to the diagnosis of the original disease which gives rise to it, and in the fact that the physician's attention is thus called to the possibility of an aneurism or other tumor pressing on the trunk of the nerve, and which a careful exploration may reveal.

In those cases in which the cause of the affection cannot be discovered, it becomes a nice problem to determine the proper course to pursue. That syphilis will produce these affections is a matter of observation, though just what lesion of syphilis is always responsible for the occurrence it is difficult to say, and yet if a syphilitic history can be obtained, or even if it is not satisfactorily obtained, it is justifiable, where there is the slightest suspicion of the infection, that the patient should be placed under antisyphilitic treatment. At the same time the tendency to atrophy of the muscles should be counteracted by proper measures. All muscles at rest from paralysis or any other cause, as we know, soon undergo fatty degeneration and atrophy. If there is hope, then, that the lesion of the nerve-trunk may be remedied, endeavor must be made to preserve the muscular structures of the larynx in a condition of health until that end is attained. For this purpose the use of the Faradic current should be used, as noted further on. In those cases in which no assignable cause can be discovered, in which no specific history can be obtained, the cause of the affection remaining in obscurity, it simply remains to correct any tendencies that may exist, remove any possibly exciting causes of nervous trouble, such as scrofula, the tuberculous diathesis, anæmia, malaria, etc., and correct as far as possible the general condition. In the myopathic paralyses, viz., those affections in which the individual muscles are paralyzed and in which the disease has its origin in the muscular structures themselves, the treatment must necessarily be mainly local, though, of course, here also it is of importance to correct general conditions which may present indications for treatment, and build up the general health as far as required. In addition to this we possess two remedies whose use oftentimes promises good results, namely, strychnine and electricity. Strychnine should be administered hypodermically from the $\frac{1}{60}$ to the $\frac{1}{50}$ of a grain, daily, in preference to its internal administration; but where its hypodermic administration cannot be carried out it should be given internally.

Electricity.—This, above all other remedies, is one which promises the best results in these local paralyses. Of the galvanic and Faradic currents the latter should receive the preference, although writers often recommend that they should be alternated. In applying the electric current, the more nicely

and perfectly the current is localized in the paralyzed muscle, the better the results that may be expected. For this nicer localization of the current a number of instruments have been devised, by which the application may be made directly to the affected muscle by means of electrodes introduced into the laryngeal cavity. The principle on which these instruments

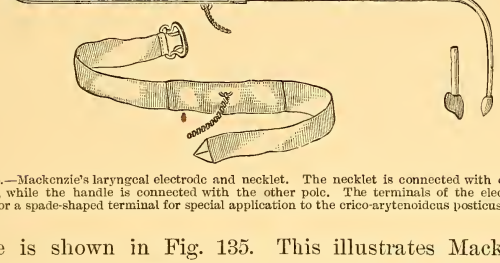

FIG. 135.—Mackenzie's laryngeal electrode and necklet. The necklet is connected with one pole of the battery, while the handle is connected with the other pole. The terminals of the electrode are a metal ball, or a spade-shaped terminal for special application to the crico-arytenoideus posticus muscle.

operate is shown in Fig. 135. This illustrates Mackenzie's laryngeal electrode, which is connected with one pole of the battery, the other pole being connected with an electrode which is either held in the hand of the patient, or better still, against the skin over the larynx, by means of the necklet shown in the figure. An electrode having been introduced into the laryngeal cavity, and as near as possible upon the muscle which it

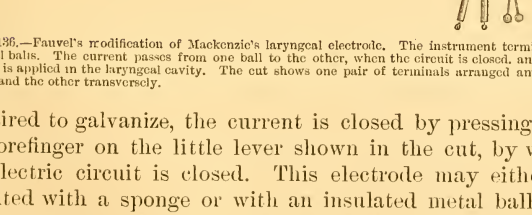

FIG. 136.—Fauvel's modification of Mackenzie's laryngeal electrode. The instrument terminates in two metal balls. The current passes from one ball to the other, when the circuit is closed, and the instrument is applied in the laryngeal cavity. The cut shows one pair of terminals arranged antero-posteriorly, and the other transversely.

is desired to galvanize, the current is closed by pressing with the forefinger on the little lever shown in the cut, by which the electric circuit is closed. This electrode may either be mounted with a sponge or with an insulated metal ball. In Fig. 136 is shown Fauvel's modification of this instrument, in which the two poles are united in one instrument, the current

passing between the two metal balls at the end of the electrode, thus enabling the operator to confine the current to a single muscle. The use of these electrodes for the nice localization of the current, requires rather deft manipulation and also a certain degree of tolerance on the part of the patient which prevents their use being of universal application; hence, it will oftentimes be necessary to abandon or postpone the attempt to apply the current within the larynx. Promising results may often be obtained by making applications over the thyroid cartilage, passing the current directly through the larynx by means of sponges held upon this region, or what is better still, applying one pole to the recurrent laryngeal nerve at the side of the neck, while the other is held over the thyroid cartilages in front. In making applications of electricity, the current should not be too strong, or the sittings prolonged.

Hysterical Aphonia.

This term is used to designate a form of aphonia which we occasionally meet with, characterized by a complete loss of voice, in which there is deficient muscular action, due to no pathological lesion but purely functional in character. It is sometimes designated as hysterical paralysis of the vocal cords, and again as functional paralysis. The idea that this is a sham paralysis, or that it arises in any attempt to deceive, should not be entertained; and yet there is no genuine paralysis, no pathological condition, no loss of contractility in the muscular structures, and no loss of conducting power in the nerves. The true nature of hysteria I do not propose to discuss, or the character of the numberless phases which it assumes, but simply to asseverate that, as far as the patient is concerned, hysterical paralysis is a true paralysis for which the sufferer is not directly responsible, and that, whereas it has the appearance of being a counterfeit, the patient cannot control it. The important point, and the one to be emphasized in the consideration of this affection is, that while the condition is one that can always be assumed under voluntary effort, it is still one which is assumed by the patient under the influence of this strange psychical condition, or by whatever other term we may choose to designate it, and not one which the patient wilfully assumes with the desire to deceive or excite sympathy.

Furthermore, hysterical aphonia or paralysis never counterfeits any of those forms of paralysis which cannot be assumed by voluntary effort. The respiratory movements of the vocal cords are involuntary, while the movements of phonation are voluntary. Abduction of the cords being purely an involuntary motion, and occurring only during the act of inspiration, and never as a purely voluntary act, paralysis of the abductors is rarely met with as a functional or hysterical paralysis. Again, both the phonative and respiratory movements in the larynx are symmetrical; hence, whether the act be voluntary or involuntary, a unilateral paralysis of the vocal cords can never occur as a hysterical or functional affection. The form which the disease under consideration assumes is that of imperfect approximation of the cords, resembling somewhat the condition which we meet with in double paralysis of the recurrent nerve. The patient does not bring the vocal cords into sufficiently close approximation for phonation; she does, however, adduct the cords somewhat, and the sound produced by the passage of air through the partially closed rima glottidis is thrown into articulation by the lips and tongue, etc.; the loud voice is lost, and the patient simply communicates in a whisper. The affections which the disease under consideration may simulate are, subacute or chronic laryngitis, those cases of aphonia which are due to mechanical interference with the proper closure of the cord, by thickening of the arytenoid cartilages or commissure, and bilateral paralysis of the recurrent laryngeal nerves. Subacute or acute laryngeal catarrh is often accompanied by complete loss of voice; but the laryngeal examination will reveal the complete mobility of the cords, and in addition, the source of the aphonia in the catarrhal inflammation of the mucous membrane lining the larynx, accompanied by swelling of the membrane covering the cords, which has resulted in loss of voice simply from the thickened condition of the cords. If the arytenoids or the commissure are so far swollen or infiltrated as to offer a mechanical obstacle to the proper closure of the cords, this will be easily recognized. In double paralysis of the recurrent laryngeal nerves all the muscles of the larynx are completely paralyzed, the cords are absolutely motionless, in a position midway between extreme adduction and abduction, namely, in the so-called cadaveric position. This position of the vocal cords

cannot be assumed or simulated, for while under voluntary effort the cords may be partially approximated and brought into the same position of half-way approximation, or into the cadaveric position, the instant that inspiration occurs, the glottis will be widened under the involuntary movement, which always attends the inspiratory act, and the movement can be seen to take place. This is the characteristic condition which we meet with in hysterical or functional paralysis; it is always a bilateral affection, and always assumes the form of incomplete closure of the glottis. It may not improperly be designated as bilateral paresis of the adductor muscles, only that this would involve the idea of some genuine lesion of the nerve-trunk or the muscular structures which, as before stated, does not exist. Simon has reported a case of hysterical or functional paralysis of the abductor muscles, in which the paralysis seemed complete, producing that very grave condition to be described under the head of bilateral paralysis of the crico-arytenoidei postici muscles. The apparent dyspnœa was so great that preparations were made to perform tracheotomy when, according to the account, the patient suddenly spoke, and the condition disappeared.

That hysterical paralysis may assume the character of this serious affection is undoubted, as any one can demonstrate on his own person by imitating an inspiratory dyspnœa, closing the glottis, and attempting to inspire, producing a noisy stridulous inspiration; but that this can be kept up for any length of time is questionable. In Simon's case, however, there was a false color in the picture, in that there was aphonia in connection with the paralysis of abduction, and this, as we know, does not occur in the disease referred to; the voice, usually, is nearly normal. A careful study of the larynx, will serve to clear up the diagnosis of these cases, and enable the physician to determine with a considerable degree of certainty that the aphonia is a functional disorder, and not due to any pathological lesion, simply by exclusion; for, as a rule, the laryngeal image does not and will not present a complete picture of any of the forms of genuine paralysis. In addition to this there will be the usual accompanying general evidences of the hysterical temperament, which we all recognize and which it is not necessary to describe here. It should be added also that cough is present in hysterical aphonia, while in genuine pa-

ralysis of the adductors, it is entirely lost; the possibility of a cough being dependent on the ability to close the glottis, whether this closure be by voluntary or involuntary muscular effort. Furthermore, the onset of this form of laryngeal paralysis is quite sudden. It comes on without any previous warning whatever, and with no symptoms which have in any way called attention to the larynx. Ordinarily a patient awakens in the morning and discovers that she cannot talk. The crucial test, and one which can be relied on with great certainty for diagnostic purposes, is the administration of an anæsthetic. Where there is any doubt as to diagnosis ether should be given, when, as a rule, it will be found during the second stage of anæsthesia, namely, that of excitement, the patient will break into a very satisfactory use of the voice. It is unnecessary to say that the victims of this disorder are women from fifteen to forty-five years of age, and most frequently unmarried, or those in whom the sexual life has been perverted.

Treatment.—The judicious management of a case of hysterical aphonia, as that of any other form of hysteria, requires far less special skill than good sense. It is utterly unsafe to treat these cases as unreal or as dishonest. As far as the patient is concerned, the paralysis is a genuine paralysis, as much so as if the trunk of the nerve were destroyed; and the recognition of this fact is of the utmost importance in the successful management of the case. Hence, within bounds it is not only justifiable but even necessary to treat it as a real paralysis. In addition, therefore, to the removal of any exciting causes, such as uterine disease, etc., resort should be had to local treatment; the end in view is to convince the patient that she can use her voice. It is not always an easy matter to do this without resorting to some method of removing the morbid condition which she believes to exist. Hence, one way of accomplishing this is by resort to local measures of treatment, securing the patient's confidence and assuring her that such and such measures will be attended with success, and that at some designated time the complete restoration of the voice will be effected. In Simon's case, previously alluded to, a profound impression was made on the patient by the preparations for tracheotomy, with the result of completely removing the paralysis. This procedure may be successfully imitated in any manner which the ingenuity of the physician may devise.

CHAPTER XXI.

NEUROSES OF THE LARYNX (Continued).

Bilateral Paralysis of the Abductor Muscles of the Larynx.

The crico-arytenoidei postici muscles, whose special function consists in their action as glottis-openers, possess an interest which is somewhat unique, both from a physiological point of view, and from the fact that any morbid condition which involves an abolition of their healthful activity is attended with the gravest and most serious consequences. They arise from the posterior surface of the cricoid cartilage, and are inserted into the outer angle of the arytenoid. By their contraction they rotate the arytenoids outwardly, thus separating the vocal cords and opening the rima glottidis. This function lies entirely and exclusively in this pair of muscles, and Nature has provided no other means by which the glottis can be opened. This so-called respiratory function of the larynx is brought into play with every act of inspiration, rendering this pair of muscles among the busiest in the body, in that they are kept in a state of constant activity from the first breath drawn in infancy until death puts an end to all functions.

By the peculiar conformation of the vocal cords, while expiration is purely passive, and the exit of the current of air is permitted without muscular action on the glottis, the entrance of the current of inspired air is arrested unless the cords are separated by the action of the glottis-openers. The upper surface of the vocal cords is broad, flattened, and somewhat depressed or excavated, in such a manner that the current of in-going air, striking them from above, while the cords are approximated, tends to throw them still closer together, in a way very much resembling the action of the semilunar valves of the heart. In other words, the rima glottidis is more or less completely closed to the entrance of air by the valve-like

action of the vocal cords, unless this little pair of muscles open it by their contraction, as shown in Fig. 137.

This action of the glottis-opening muscles is purely involuntary, in that it is entirely beyond the control of the will, and also that it must necessarily go on during sleep, as well as during waking hours. It is also reflex, and does not take place except under the influence of an in-going current of air impinging upon the laryngeal cavity, for, as we know, after the operation of tracheotomy, it ceases, and, if we examine the larynx of a patient wearing a tracheal tube, we find the cords at perfect rest. Reasoning from analogy, we are justified in the conclusion that this glottis-opening function of the larynx is presided over by an independent ganglionic centre, situated in the brain, but which neither physiological experiment nor pathological investigation has as yet been able to locate. Since the introduction of laryngoscopy there have come within our notice a group of grave laryngeal affections, characterized by a peculiar set of symptoms, which laryngoscopic investigation shows to be due to the abolition of this glottis-opening action in the larynx during inspiration.

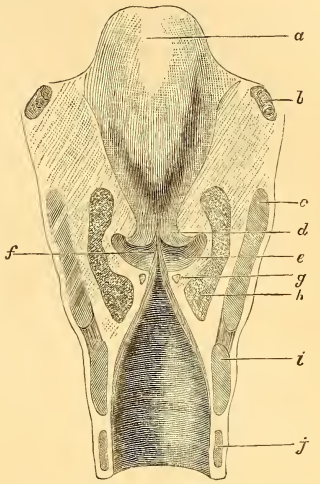

FIG. 137.—Transverse section of the larynx: *a*, epiglottis; *b*, hyoid bone; *c*, thyroid cartilage; *d*, ventricular band, or false cord; *e*, ventricle of the larynx; *f*, rima glottidis; *g*, true vocal cord; *h*, thyro-arytenoid muscle; *i*, cricoid cartilage; *j*, first ring of the trachea. (Bristowe.)

Symptoms.—Under the name of bilateral paralysis of the abductors of the larynx, or of the crico-arytenoidei postici muscles, there have been reported a number of cases in which the symptoms present something like the following picture: The patient begins to suffer from a peculiar dyspnœa, in which the difficulty attends the inspiratory act entirely, and not the expiratory act. This is generally spoken of as inspiratory dyspnœa. Accompanying this constant state of dyspnœa, the patient also suffers from exacerbations, or spasmodic attacks,

recurring with more or less frequency, in which all the symptoms are markedly aggravated, and which may excite the gravest apprehension, according to the extent of the interruption to the entrance of air into the lungs. Accompanying this apparently very grave laryngeal obstruction, it is noticeable that the voice is not affected or is but little impaired. This feature of the disease often seems an extremely surprising one. Remembering, however, the morbid condition which gives rise to the affection, we can easily understand why this should be. The grave symptoms of the disease occur in connection with inspiration, while phonation is accomplished under the action of those muscles which are unimpaired, and during the act of expiration.

These attacks of inspiratory dyspnœa, mild at the onset of the affection, and not giving rise to any serious apprehension, gradually become more serious in character; and, in addition to this, the spasmodic attacks recur with greater frequency and become of a more urgent type, until finally, unless the disease is arrested, tracheotomy becomes necessary, and, furthermore, the wearing of the tracheal canula during life. This, however, would simply indicate that, where a case has gone on to such an extent that tracheotomy is imperatively demanded, the muscles have become so disorganized that all hope of restoring them to healthy action is lost; and, apart from this healthy action, we possess no means by which the entrance of air can be secured through the larynx. Hence, tracheotomy becomes an absolute necessity. The glottis is closed, and it should be added that this closure of the glottis is not due alone to paralysis of the abductor muscles, but the essential gravity of the affection lies in the fact that the crico-arytenoidei laterales muscles retain their integrity; that is, paralysis of the abductor muscles is not alone sufficient to produce the affection, but the adductor muscles, being unopposed in their action, rotate the arytenoid cartilages inward, and thus bring the cords into apposition. A perfect closure is thus accomplished, and a total arrest of the entrance of air, by the valve-like action of the vocal cords, which is only manifested of course when the cords are in apposition. Hence, it seems to me, there can be no doubt that, if we have both the muscles paralyzed, as is the case in paralysis of both recurrent laryngeal nerves, the condition which I have described does not occur.

Examination.—If a laryngoscopic examination be made the appearance will be striking and characteristic. The cords will be found lying in the median line, in a state of parallelism, and almost entirely motionless, the chink of the glottis presenting a narrow slit-like opening from one to two lines in extent (see Fig. 138). The cords, however, are not absolutely motionless, for, as already noticed, the voice is not, as a rule, markedly impaired; hence, during the act of phonation, the slight movement necessary to bring the cords into apposition will be noticed. There will also be seen a slight separation of the cords during a forced expiration (see Fig. 139). This is due entirely to the action of the current of air, and not to any muscular effort.

There may, in cases, be seen a condition of hyperæmia, or even catarrhal inflammation of the mucous lining of the larynx, but this is not a condition which in any way belongs to the disease.

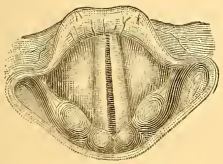

FIG. 138.

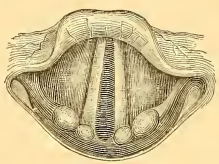

FIG. 139.

FIG. 138.—Bilateral paralysis of the abductors. Position of the cords in inspiration.
FIG. 139.—Bilateral paralysis of the abductors. Position of the cords in expiration.

There are so many features of this affection which are interesting, that I have thought it well to add here the histories of four cases which have come under my own observation, together with a résumé of the cases which have been reported by others.

CASE I.—Richard Dowling, Irish, aged forty-six, a sailor, came to the clinic at Bellevue in February, 1875, with the following history: Fifteen years ago he had a primary sore, but never had any secondary or tertiary developments of syphilis, other than alopecia and osteocopic pains. For a year before coming under notice, he had been suffering from gradually increasing shortness of breath, and within two months had been subject to attacks of dyspnœa, recurring with greater frequency, and at times of an exceedingly alarming character. An examination made at this time by Dr. Bangs, and also by myself, revealed complete paralysis of the abductor muscles of both sides. The cords were quite motionless, with but a narrow opening between them. There was also a considerable degree of chronic inflammation of the mucous

membrane lining the larynx. A careful examination of the chest, repeated several times, and made with special reference to the possibility of aneurism, revealed no morbid condition. Various plans of treatment were carried out in this case, especially the administration of large doses of iodide of potassium, but without any effect on the symptoms or the laryngoscopic appearances. He made a number of visits at the dispensary, and several times during the examinations he had attacks of dyspnœa, which were of so grave and alarming a character that a fatal issue was feared. On the 21st of March, 1875, laryngotomy was done by Dr. Katzenbach, the tube being inserted through the crico-thyroid membrane. Aside from ulcerations occurring on the posterior wall of the trachea, produced by the irritation of the tube, and resulting in fungus-like granulations, which bled occasionally, the case presented no new symptoms, and the tube was worn until death occurred, on the 28th of November, 1877. He died with symptoms of spinal meningitis. No autopsy was permitted.

Case II.—In May, 1878, I was asked by Dr. H. F. Walker to see a patient in Bellevue Hospital, suffering from urgent dyspnœa. I found the man, a sailor, aged forty, suffering from the peculiar inspiratory dyspnœa which suggested bilateral paralysis of the abductors. A laryngoscopic examination showed the peculiar motionless condition of the vocal cords, with marked hyperæmia of the mucous membrane. His voice was husky, but not lost. He gave a clear history of having contracted syphilis ten years before. A year before I saw him he had begun to suffer from moderate shortness of breath, with occasional attacks of dyspnœa of an apparently spasmodic character. These attacks recurring with greater frequency and severity, he came to Bellevue, where I saw him on the day after his admission. I advised tracheotomy, but, the immediate attack subsiding very soon, it was not done, and the man left the hospital a few days afterward suffering from mere shortness of breath. A few days subsequently, another paroxysm coming on, he was taken to St. Luke's Hospital, where tracheotomy was performed, after which he was subjected to treatment by electricity, in connection with the internal administration of iodide of potassium, with an apparent slight improvement, as often occurs in these cases. It was delusive, however, and he subsequently left the hospital with the tube in, and was lost sight of.

Case III.—On August 9, 1880, I was requested by Dr. J. A. McCreery, of this city, to see a patient with the following history: M. Q., Irish, aged forty-eight, a laundress, of good family history, had complained for over a year of a feeling of discomfort in the throat, which caused no special uneasiness until April, 1880, when she began to have some difficulty in swallowing. At this time there was some induration of the cervical glands, with œsophageal obstruction, as evidenced by the passage of the bougie; but the laryngoscopic examination revealed no morbid condition. Early in July, however, there was noticed, projecting from the orifice of the œsophagus, an irregularly nodulated mass, presenting the characteristic appearances of epithelioma, serving to confirm the suspicion already entertained that the disease was epithelioma of the œsophagus. On August 6, 1880, Dr. McCreery requested me to see her, and my diagnosis was only confirmatory of his. I saw the patient a number of times, and observed the progressive increase of the tumor, together with a deficient action of the glottis-opening muscles, which seemed to be more marked each time I saw her. This was also evidenced by recurring attacks of dyspnœa, which were of a spasmodic nature, and which soon became of an alarming character. I last saw her on September 27th. At this time the action of the abductor muscles seemed to be completely abolished, and, as the dyspnœa was quite marked, I advised that tracheotomy be performed. Preparations were being made for

the operation, when she suddenly expired, early on the morning of September 29th. Death resulted from the paralysis, as the tumor in no way encroached upon the larynx. The paralysis in the case was due, of course, to the infiltration of the muscular fibres by the malignant growth.

Case IV.—E. C., a Frenchman, aged forty-two, a merchant, consulted me, August 19, 1880, at the request of Dr. A. Borde, of New Orleans, and gave the following history. He had always enjoyed good health, with the exception of occasional attacks of palpitation of the heart, which he had been told was due to an enlargement of that organ. The pulse was always quite rapid, but his heart trouble had never given him any uneasiness. He had always lived a perfectly temperate life, and indulged in no excesses. He was not in the habit of using tobacco, and never drank spirituous liquors. For ten years he had been subject to occasional attacks of dyspnœa, which were always of an inspiratory character, inspiration being attended by a noisy stridor, while the attack lasted, which was generally from two to five minutes only. There was no marked difficulty in deglutition, yet he was compelled to swallow quite slowly, or the act would bring on an attack of dyspnœa. He had formerly been fond of singing, but had been compelled to abandon it, as the voice had become weakened, and tired easily. Moreover, prolonged use of the voice or loud talking was apt to bring on the spasm. The uvula and the tonsils had been removed, but with no result. Physical examination of the chest showed the lungs perfectly healthy. The heart was moderately enlarged. Pulse, 96.

An examination of the larynx revealed the characteristic appearance of bilateral paralysis of the abductor muscles. The cords were in a state of parallelism, about one line apart, and quite motionless. The mucous membrane lining the larynx was in a state of chronic catarrhal inflammation, and somewhat relaxed. In addition to this, there was a markedly relaxed condition of the vocal cords, constituting the so-called elliptical paralysis, or paralysis of tension.

The singular feature of the case was the long standing of the paralysis without tracheotomy having become necessary. This is partially accounted for by the existence of the elliptical paralysis, which, of course, increased the area of the breathing space. Another element of the case, also due to his chronic laryngitis, which thus became eminently a conservative condition, was a certain amount of thickening of the inter-arytenoid commissure, which served to hold the arytenoid cartilages apart during inspiration. The result of these two conditions was to render the voice somewhat weak, but, on the other hand, they so widened the rima glottidis that quiet respiration was carried on with comparative ease.

Case V.—Riegel,[1] in 1872, reported the case of a boy five years of age, who, during his second year, had an attack of quinsy, from which he recovered without any bad results. In his third year he began to suffer with inspiratory dyspnœa, the voice remaining unimpaired. At the end of his fifth year he was brought under Riegel's notice in a weak and emaciated condition, with enlarged and suppurating lymphatic glands. Laryngoscopic examination revealed the characteristic appearance of bilateral paralysis of the abductor muscles. Therapeutic measures were powerless to relieve, and the patient died from a subsequent attack of measles with pneumonia. An autopsy in this case revealed both recurrent laryngeal nerves compressed by dense connective tissue, and the nerve-fibres in a state of fatty degeneration and atrophy. The pneumogastric and sympathetic nerves were normal. The crico-arytenoidei postici muscles were in a state of atrophy, while the other muscles of the larynx were normal.

[1] Ziemssen, from Berlin. klin. Wochenschrift, Nos. 20, 21, 1872; No. 7, 1873.

CASE VI.—Riegel,[1] in December, 1874, reported the case of a man, fifty-eight years of age, a guide by occupation, who was admitted to the hospital in Cologne, giving a history of attacks of dyspnœa, cough, and expectoration, of a month's standing. He had the characteristic inspiratory dyspnœa, and breathing was very labored. Laryngoscopic examination revealed bilateral paralysis of the abductors, with the mucous membrane in a state of catarrhal inflammation, with ulceration. Tracheotomy was performed the day following his admission. The man had also serious pulmonary disease, which was undoubtedly aggravated by the introduction of the tube. Death occurred one week after the operation, from the lung disease. On post-mortem examination, the posterior crico-arytenoid muscles were found to be in a state of complete atrophy, scarcely a trace of muscular tissue being found. All the other laryngeal muscles were normal, as were the recurrent and pneumogastric nerves.

CASE VII.—Penzoldt[2] reports the case of a woman, sixty-one years of age, who came under his observation, with a history of former syphilis and cerebral apoplexy. She presented extensive cicatrices in the pharynx and soft palate. She gave the clinical history of inspiratory dyspnœa. Laryngoscopic examination revealed the cords motionless in the median line, with a moderate degree of catarrhal inflammation of the lining membrane of the larynx. Tracheotomy was performed to relieve dyspnœa, but death ensued in a few days, the result of an existing pulmonary disease. Post-mortem examination revealed a degeneration of the crico-arytenoidei postici muscles, while the other laryngeal muscles were normal. There was a moderate degree of degeneration of the recurrent nerves, extending to the pneumogastric and spinal accessory, with moderate sclerosis of the medulla oblongata.

CASE VIII.—Feith[3] reports the case of a woman, sixty-eight years of age, who was seized with an attack of facial erysipelas, which was followed by a double pneumonia, both of which underwent fair resolution; but at the end of the sixth week after the attack of erysipelas, and two weeks after the resolution of the pneumonia, she was suddenly seized with paroxysms of inspiratory dyspnœa, which, gradually increasing, became of an extremely alarming character, the voice not being impaired. The laryngoscope showed paralysis of abduction, the laryngeal cavity being otherwise normal. At the end of four or five days after the first onset of the dyspnœa, tracheotomy became necessary. Electrical and other treatment failed to accomplish any good result, and the patient continued to wear the tube.

CASE IX.—H. von Ziemssen[4] reports the case of a man, aged twenty-six, who had always enjoyed good health, and who on New Year's day, of 1871, was seized with dyspnœa of an inspiratory character, followed by recurring exacerbations. These recurred at first only at night, but, gradually increasing, appeared during the day, being brought on by any unusual effort. The symptoms growing worse, on August 11, 1871, seven months and a half after the beginning of his trouble, he was compelled to seek hospital treatment, at which time the laryngoscope showed the motionless condition of the vocal cords, with moderate injection of the mucous membrane lining the larynx. The voice was not much impaired; no traces of syphilis were found. He was placed under treatment by electricity, which was continued for six weeks, when he was discharged cured.

CASE X.—Mackenzie[5] reports the case of an American gentleman, aged sixty-

[1] Ziemssen, from Volkmann's Sammlung klin. Vorträge, No. 95.

[2] Ziemssen's Cyclopædia, vol. vii., p. 962.

[3] Ibid.

[4] Ibid., vol. vii., p. 963.

[5] Mackenzie, On the Laryngoscope, p. 217.

one, a lawyer, who for thirty years had complained of a weak voice. For eighteen years he had been subject to cramps in the throat, and for eight years had suffered from dyspnœa, which had gradually but slowly increased. The examination revealed paralysis of the abductor muscles. Tracheotomy became imperative, and the gentleman is still wearing the tube, as I am informed by Dr. Roe, of Rochester, under whose observation he is at present.

CASE XI.—Rehn [1] reports the case of a boy of thirteen, convalescing from an attack of typhoid fever, who was attacked fourteen days after the cessation of the fever with shortness of breath, which was increased by the slightest exertion. Laryngoscopy showed complete paralysis of abduction of the cords. Tracheotomy was performed, the tube being worn fifteen weeks, and the patient kept on a supporting and general tonic treatment. At the end of this time the tube was removed, the cure being satisfactory.

CASE XII.—Dr. Lefferts [2] reports the case of a robust Irish woman, about forty years of age, who came to him on the 8th of May, 1876, with a history of what was probably an attack of mucous patches in the mouth, five years before, with a recurrence of specific disease in the form of extensive ulceration in the fauces in December, 1875. A few days previous to her visit, she began to suffer with difficulty in breathing, which was at first but slight in character, and only noticeable after an unusual exertion and at night; gradually it began to show itself during the day also. The voice was unaffected. There was the characteristic inspiratory dyspnœa. Laryngoscopic examination showed complete paralysis of the abductors, with a slightly reddened condition of the mucous membrane. She was immediately put on full and increasing doses of iodide of potassium, with the most excellent results, as all evidences of the disease had disappeared at the end of six weeks.

CASE XIII.—Dr. Lefferts [3] reports a second case, that of a woman thirty-five years of age, who gave a very clear history of syphilis. In October, 1877, she contracted a severe cold, soon followed by difficulty of breathing, with hoarseness. This increased rapidly until the dyspnœa became distressing and constant. This passed away, however, under treatment, but in April, 1878, as the result of a fresh exposure, a progressive dyspnœa again set in, which did not yield to treatment. During the second week she had paroxysmal attacks of dyspnœa both day and night. On June 1, 1878, Dr. Lefferts saw her, after a very grave and alarming attack of dyspnœa. When he first saw her the subjective symptoms were not prominent, but laryngoscopic examination showed complete paralysis of the abductors of the vocal cords, with the whole mucous membrane lining the larynx in a state of hyperæmia. She was immediately placed under the influence of iodide of potassium with mercury, with most excellent results. The subjective symptoms disappeared, and a satisfactory condition of mobility of the cords followed.

CASE XIV.—Dr. Cohen [4] reports the case of a gentleman, forty-six years of age, whose only vice had been the excessive use of tobacco, who consulted him, giving the history of cough, dyspnœa, and occasional attacks of spasm of the glottis extending over two years. The spasm was induced always by the irritation of the external auditory meatus. Laryngoscopic examination showed paralysis of the left abductor muscle. The spasms recurred with such violence that tracheotomy became necessary. Very soon after the operation the muscles of the right side also became para-

[1] Von Ziemssen's Cyclopædia, vol. vii., p. 965.

[2] New York Medical Journal, December, 1878.

[3] Ibid.

[4] Diseases of the Throat, 2d ed., p. 654.

lyzed, and the glottis remained so entirely closed that Dr. Cohen suspected spasm of the crico-arytenoideus lateralis and arytenoideus muscles. The patient continues to wear the tube, all treatment having proved useless.

Case XV.—Burow [1] reports the case of a man, aged sixty-two, who came to his clinic January 5, 1879, with a history of dyspnœa of four months. The inspiration was very noisy; the voice was normal. Laryngoscopy revealed the usual picture of paralysis of the abductors. January 14th the trachea was opened, but the patient died from pulmonary disease two weeks later. The autopsy revealed a hyperplastic mass pressing on both recurrent laryngeal nerves, with atrophy and fatty degeneration of the two abductor muscles.

Case XVI.—Meschede, of Königsberg,[2] reports a case as follows: A girl, aged nineteen, was brought to him by her mother, with the history of complete aphonia of two months' standing. There was some bloody expectoration, but no signs of lung disease. The prominent symptoms were those of marked inspiratory dyspnœa, with noisy inspiration at all times, but extreme on slight exertion. Menstruation had ceased for several months. The laryngoscopic examination was made with difficulty, but revealed the usual appearance of paralysis of the abductor muscles of the cords. There was a suspicion of hysteria, but this diagnosis was abandoned, on the ground that the cords could not be maintained in a state of approximation so long a time. The false color in the picture here of course was the aphonia, but it was interesting to note that, under the threat of using the actual cautery, she recovered the use of the voice. The dyspnœa persisted, however, and finally yielded only to the subcutaneous injection of strychnia. After four months' treatment she was entirely cured.

Case XVII.—Among Dr. Warren's surgical cases [3] I find the following: A child, aged three, was brought to the hospital, July 17, 1876, with the following history: Eight months ago he had a severe cough, followed in three weeks by enlargement and finally suppuration of the cervical glands. At this time the child, though not well, was not really sick. About the middle of January the voice became husky, and the child began to suffer from inspiratory dyspnœa. The symptoms were alarming for a time, but finally an improvement set in, and was progressing fairly, until a few weeks before the child was brought to the hospital, they recurred in an alarming degree, the prominent features being marked inspiratory dyspnœa, with noisy inspiration and recurring paroxysms of a serious character. Dr. Knight now saw the child, and made the diagnosis of paralysis of the abductors of the larynx. On July 21, 1875, tracheotomy was performed. Treatment for the relief of the paralysis was of no avail, and I learn from Dr. Knight that the child, now eight years old, still wears the canula.

Case XVIII.—Dr. John S. Blake [4] reports the following: A girl of six years was brought to him October 25, 1876, with the following history. Six months before she had scarlet fever and diphtheria of unusual severity, but had made a perfect recovery. A week before he saw her she had a croupy cough, with noisy breathing at night. The voice was unaffected. A yellowish exudation was found on the tonsils. The symptoms becoming worse, Dr. Knight was called to see her, and on laryngoscopic examination discovered the characteristic appearances of paralysis of the abductors, and advised tracheotomy. This was deferred for a few days, but was finally resorted to when the patient was *in extremis*. The respiration was established, and treatment at the same time was instituted for the deposit, which was

[1] Berliner klin. Wochenschrift, Nos. 33, 34, 1879.

[2] Ibid., No. 17, 1878.

[3] Boston Med. and Surg. Jour., August 31, 1876.

[4] Ibid., August 23, 1877.

probably diphtheritic. At the end of a week the tube was removed and recovery was complete.

CASE XIX.—Dr. Knight [1] reports the following case: A man aged thirty-six, a ship-carpenter by trade, was referred to him by Dr. Ingalls in September, 1868, with the following history. In 1854 he had had a primary sore, followed in six months by an eruption on the skin, and in the years following, up to the time Dr. Knight saw him, he had repeated attacks of rheumatism, skin eruptions, and sore-throat. In December, 1867, he began to have sore-throat with hoarseness, and to fail in strength. A laryngoscopic examination at the time revealed the chronic laryngitis of syphilis. After treatment for two weeks, he was improving, when he disappeared, and was not again seen until August, 1869, when he presented himself with a tube in the trachea, which had been inserted in March, seven months after he had disappeared, for a progressive dyspnœa. An examination showed paralysis of the abductors. He continued to wear the tube.

CASE XX.—Dr. Glynn [2] reports the case of a man, aged thirty-six, who was admitted to the Royal Infirmary in Liverpool, January 16, 1877, suffering from inspiratory dyspnœa, etc., the result of an exposure to cold three weeks previously. Examination showed acute inflammation of the membrane of the larynx and fauces, with paralysis of the abductor muscles. Local and internal medication was of no avail, and tracheotomy became necessary, January 19th. The local application of electricity was now used, and in two months the tube was removed. As late as June 20th there had been no recurrence of the trouble.

CASE XXI.—Dr. A. H. Smith [3] reports the following case: F. C., aged fifty, a messenger, consulted Dr. Smith, on September 8, 1877, suffering from an urgent dyspnœa, which had been coming on two years, but had grown much worse during the previous fortnight. The voice was husky, but otherwise normal. An examination showed the cords motionless in the median line, with a moderate hyperæmia of the mucous lining of the larynx. The patient gave a clear history of syphilis, contracted ten years before, followed by secondary lesions. Tracheotomy was performed the following day, and the patient was put on the use of full doses of iodide of potassium, and localized faradization was used. The treatment resulted in complete cure of the paralysis at the end of four weeks. The tube causing considerable irritation, it was removed. Six weeks later the disease returned suddenly, and before the operation could be repeated the patient died.

CASE XXII.—Dr. Knight [4] reports the case of a lady, aged sixty, who, after a slow convalescence from typhoid fever, developed a cough with hoarseness, which finally resulted in dyspnœa of a spasmodic character. An examination revealed the usual appearance of bilateral paralysis of the abductor muscles. The dyspnœa becoming severe in character, tracheotomy was performed. Treatment was of no avail, and the tube was worn permanently.

CASE XXIII.—Dr. Robinson,[5] of New York, reports the following: A railway detective came under his care, with a clear history of syphilis of seventeen years standing. In addition to some general nervous symptoms, he began to have marked dyspnœa two years before, characterized by exacerbations recurring with more or less frequency. Examination of the larynx showed paralysis of the abductors. He

[1] Boston Med. and Surg. Jour., September 30, 1869.

[2] Lancet, September 1, 1877.

[3] Am. Jour. of the Med Sci., January, 1878.

[4] Boston Med. and Surg. Jour., February 25, 1869.

[5] Am. Jour. of the Med. Sci., April, 1878.

was put under specific treatment with but little avail; but, the symptoms not being sufficiently urgent, tracheotomy was not done, and he was subsequently lost sight of.

Case XXIV.—Juraz [1] reports the following case: The patient, during convalescence from typhoid fever, which set in May 1. 1877, was seized with dyspnœa of the peculiar inspiratory character, the voice not being impaired. This increased, and on June 28, 1877, two days after the dyspnœa set in, tracheotomy became imperative. June 20, 1878, a year afterward, still wearing the canula, he went to Czerny, who for the first time made application of electricity, and found good reaction in all the laryngeal muscles, except the abductors, but in these only a very feeble reaction. Several months of treatment, however, failed to give any permanent results.

Case XXV.—Whipham [2] reports the case of a cabman, aged twenty-six, who came to the out-patient department of St. George's Hospital, with the history of syphilis beginning three years before. For three months he had had sore-throat, with some dyspnœa and inspiratory stridor. Examination revealed a laryngitis, with almost complete bilateral paralysis of the abductors. His laryngitis was cured, but the paralysis remained much the same, and, under treatment for sixteen months, there was no improvement. Tracheotomy was not performed.

Case XXVI.—Dr. Weber [3] reports the following case: A man, aged thirty-seven, had been somewhat hoarse for two years, and for four months had shown decided evidence of phthisis. There was no history of syphilis. Sudden and marked dyspnœa set in, of the peculiar inspiratory character, which at the end of one week demanded tracheotomy. At the end of a month there was no improvement in the paralysis. There is no later report.

Case XXVII.—Hughlings Jackson [4] reports the case of a man, aged thirty-five, who came under his care December 5, 1864, with the history of having had syphilis several years before. For four years he had had more or less inspiratory dyspnœa. December 23d tracheotomy was performed. The following night he died from suffocation, the tube having become occluded with mucus. The autopsy revealed complete atrophy of the abductor muscles. The pneumogastric and recurrent nerves were perfectly healthy.

Case XXVIII.—Hays [5] reports the case of a man aged thirty-one, who came under his care August 4, 1879, with the history of dyspnœa of inspiratory character of two months' standing. He had had a chancre eight years before. Examination revealed paralysis of the abductors. Under treatment for two months and a half by iodide of potassium and electricity he was cured.

Case XXIX.—Mackenzie [6] reports as follows: J. H., aged forty, was admitted to hospital in January, 1878. Twenty-one months previously he had caught cold, which resulted in a severe dyspnœa, which had increased slowly until he applied for admission to hospital, when the symptoms were so urgent that tracheotomy was performed immediately. The patient died two months afterward. An examination previously had revealed paralysis of the abductor muscles. The autopsy disclosed an abscess in the posterior wall of the cricoid cartilage, which had destroyed the abductor muscles.

Case XXX.—Mackenzie [7] reports the following: C. E., aged thirty-four, a gym-

[1] Deutsche med. Wochenschrift, April 5, 1879.
[2] St. George's Hosp. Reports, 1878.
[3] Phila. Med. Times, June 19, 1880.
[4] Med. Times and Gazette, December 15, 1866.
[5] Dublin Jour. of Med. Sci., January, 1880.
[6] Diseases of the Throat and Nose, vol. i., p. 445.
[7] Ibid., vol. i., p. 443.

nast, was admitted to hospital November 22, 1876, with the history of a chancre eighteen years previously. For eight months he had been subject to recurrent attacks of dyspnœa. He was very short of breath, but the voice was normal. Tracheotomy was performed, but the patient died eight days afterward from pneumonia. An autopsy revealed degeneration of the abductor muscles. The nerves were healthy. The brain was not examined.

These cases comprise but a part of the number which have been reported; but they are mainly selected as giving information as to the cause, clinical history, and pathological changes which belong to the affection. Many of the reported cases have been rejected as incomplete and adding nothing to our information of the disease. Such as Gerhardt's,[1] Duranty's,[2] Semon's,[3] Smith's,[4] Mackenzie's,[5] Heinze's,[6] Klemm's,[7] and Guttmann and Frankel's.[8]

In glancing over the above-detailed cases, we find the causes of the paralysis as follows:

	Cases.
Syphilis	12
Convalescence from typhoid fever	3
Erysipelas	1
Chronic nicotine poisoning	1
Localized inflammation	2
Scrofula	1
Diphtheria	1
Epithelioma	1
Phthisis	2
Hysteria	1
No causes recorded in	5

We thus find that syphilis is responsible for forty per cent. of all the cases. Of these twelve patients, eight had tracheotomy performed, and were compelled to wear the tube during life, two of them, however, dying within a few days after the operation from intercurrent causes. Three of the four patients in whom the trachea was not opened were cured by internal

[1] Ziemssen's Cyclopædia, vol. vii., p. 959.
[2] Ibid., p. 965.
[3] Lancet, April 20, 1878.
[4] Brit. Med. Journal, July 13, 1878.
[5] Cases 4, 5, 6, and 8, Diseases of the Throat and Nose, vol. i., p. 444 *et seq.*
[6] Archiv für Heilkunde, xvi., 1875.
[7] Ibid., 1876, p. 516.
[8] Berliner klin. Wochenschrift, No. 10, 1878.

medication. The fourth, Whipham's, seems not to have developed any very alarming symptoms, although under observation nearly two years. In the three cases cured by the administration of medicine the disease had existed respectively, a few days, six weeks, and two months. In the six patients who wore the trachea tube permanently, leaving out of consideration the two that died, we find that the disease had existed in two cases two years, in three cases one year, and in one case six months.

The deduction from this is obvious. Prominent among the causes of the disease stands the syphilitic poison, which acts by producing some degenerative change that, if not arrested promptly, will go on to the complete destruction of the functional activity of the organ involved, beyond the possibility of its restoration. On the other hand, if the disease is recognized sufficiently early, we may entertain fair hope of cure by internal medication. In one case erysipelas was apparently the cause. In this case, although the operation was performed early, the tube was worn during life.

The case of Meschede has been introduced as affording some points of interest, but it is scarcely to be accepted as a genuine case of the disease under consideration. I have also added my own case of epithelioma and Weber's case of laryngeal phthisis, as illustrating the manner in which a localized morbid process may extend to the muscular structures to disintegrate and paralyze them, thus becoming another cause of this disease.

We also see that, in addition to syphilis, any blood poison may produce this affection; but there lies this difference: the slowly acting, chronic blood poisons—syphilis, scrofula, nicotine poisoning, etc.—have, in the cases cited, led to irreparable morbid changes, which have resulted in a paralysis not amenable to treatment; while the acute blood poisons, such as those of typhoid fever, diphtheria, etc., have resulted in a temporary paralysis, which, though of very aggravated character, and requiring tracheotomy, has yielded to treatment, and resulted in complete cure.

As regards the true pathology of the disease, it seems to me that the clinical histories of the cases given shed more light on it than the eight autopsies which were made. In one of these a tumor was found pressing on both recurrent laryngeal nerves,

with atrophy of the abductor muscles; in one, cicatricial bands pressing on each recurrent nerve, with atrophy of the abductors; in one case, degeneration of the recurrent nerve, also of the pneumogastric and the spinal accessory, with sclerosis of the medulla; but, in the five remaining cases, there was found simply atrophy of the muscles, while the nerves were unimpaired.

It will be noticed that, in all the cases examined post-mortem, the muscular structures were destroyed by degenerative changes, while the nerves supplying them were perfectly healthy in five cases and diseased in three. Furthermore, it will be observed that the muscular atrophy was confined to the abductor muscles alone, while the other muscles of the larynx, although supplied by the very nerves which were in a diseased state in three cases, and healthy in five, retained their normal integrity.

The question arises, does the seat of the original morbid changes which produce the paralysis lie in the nerve-trunks? I do not see how this view of the subject can be entertained for a moment. Any disease of the recurrent laryngeal nerve, which has progressed so far as to destroy its conductivity, must destroy and paralyze all the muscles which it supplies. In two of the cases narrated there was found pressure on both nerves, and yet the abductor muscles alone were atrophied, while the others were healthy; moreover, during life, in these cases, the other muscles were in a state of healthy functional activity.

As was said at the opening of the chapter, the essential gravity of the disease lies in the integrity of the crico-arytenoidei laterales muscles—the opposing muscles to the abductors; for, if these muscles were also paralyzed, as they must necessarily be, were the conductivity of the nerve destroyed by disease, no dyspnœa would exist; the glottis would fall into the position known as the cadaveric position, which, as we know, is sufficiently wide to allow of free and unimpeded respiration. This is illustrated by those rare cases, one or two of which have been reported, in which there was pressure on both recurrent laryngeal nerves, and in which the prominent symptom was complete aphonia, without dyspnœa. The fact that the voice is unimpaired, as a rule, in paralysis of the abductors is sufficient evidence that the other muscles of the larynx are in a healthy state. As to the suggestion I have seen made, that the disease is due to pressure on the recurrent

nerves, and that this pressure may so far discriminate between the nerve-fibres as to destroy the conductivity of those fibres alone which are distributed to the abductor muscles, it seems to me that the assertion is utterly untenable. That this might happen on one side alone, and that a tumor pressing upon the trunk of the recurrent nerve might so far select its points of pressure as to paralyze the abductor muscle of that side, is among the possibilities; that this should happen on both sides, and to both recurrent nerve-trunks, would be one of the rarest of coincidences; that it should happen in a large series of cases is simply beyond the pale of possibility.

I think, then, that we must look still further for the morbid condition which produces the disease, and not in the nerve-trunks which supply the muscles of the larynx. As suggested in the early portion of the paper, reasoning from analogy, considering the peculiar character of the respiratory movements of the larynx, in that they are purely involuntary and also reflex; that the opening of the glottis, constituting the respiratory movement, is an independent action separated from all the other movements which take place in the larynx as the result of muscular contractions; it is fair to conclude that this function is presided over by an independent ganglionic nerve-centre, and that the disease in question consists in some degenerative change taking place in this portion of the brain; that it occurs most frequently as the result of syphilis, but that it may also occur under the influence of any of the blood poisons; and that these changes become permanent and incurable unless arrested very early in the career of the disease.

In three of the autopsies made there was nerve-lesion; in all, muscular atrophy. For reasons already given, the nerve-lesion could not paralyze the abductor muscles without paralyzing the opponent muscles also. We must, therefore, conclude that these nerve-lesions are due to the same cause which, acting on the nerve-centre which presides over the respiratory movements of the larynx, has led to degeneration, and that they have occurred subsequently to it; or that the nerve-lesions, occurring first, have reacted upon the nerve-centre, and set in play forces which have acted to produce degenerative changes there; whichever of these hypotheses be the true one, the conclusion is unavoidable that the lesion of the nerve-trunk cannot account for the symptoms of the disease, and

that the central origin of the affection should be accepted as the true explanation. Additional evidence in favor of the central origin of the disease is found in the obscure brain-symptoms which attended a number of the cases reported, which would seem to point to the existence of some central lesion involving other parts than those which preside over this respiratory function of the glottis.

Mackenzie, in his earlier work,[1] writing of this affection, makes the assertion that it is due to some central lesion in the brain, and he is the only writer that I find who ventures to assign any cause for the disease. In his later work,[2] however, he seems to have abandoned this theory, and leans rather to the view that the source of the affection is in the muscles themselves. This is undoubtedly true in those cases in which we find localized infiltration from neighboring tubercular or syphilitic disease ; but in those cases cited, in which, as the result of blood-poisoning, the affection advanced slowly but surely to an untoward result, it would seem that there must be some further explanation than the localized morbid process.

If the disease were a local one in the muscles themselves, we should certainly notice in some cases that the paralysis invaded one muscle to its destruction, while its fellow remained intact. This, however, rarely, if ever, happens, for the clinical history of the recurrent spasmodic dyspnœa would show that both muscles were involved from the outset. And certainly, when they come under inspection, it is an extremely rare event to notice any difference in the motility of the two sides. Indeed, I do not think this has ever been observed in a case which was a true bilateral paralysis of the abductors, and not a secondary infiltration of the muscles.

Treatment.—As regards the treatment of these cases, what has been said in the course of the chapter is sufficient to make the prominent indications plain. Those cases in which the disease is recognized early in its course, and which are traceable to a specific taint, can be cured by medication. Those cases in which the symptoms have persisted for six months or more will eventually demand tracheotomy by the exigencies of the dyspnœa, and the tube will need to be worn during life.

I think that another and most important conclusion may

[1] Hoarseness and Loss of Voice, Philadelphia, 1869.

[2] Diseases of the Throat and Nose, vol. i., London, 1880.

be drawn. If the tracheotomy has been deferred too long, the weary and struggling muscle will have so far lost its vitality that any hope of its recovering its contractility will have been destroyed; whereas, had the disease been recognized early and the trachea opened, thereby setting at rest the respiratory movements in the larynx, there would be a much better hope that its integrity might be restored. By this, of course, I do not mean absolute and entire rest, for in such a case I should consider it of the utmost importance that the larynx should be subjected to daily use, of a moderate character, in talking and breathing occasionally with the mouth of the tube closed.

In a case, therefore, in which we recognize the condition early, and in which improvement is not accomplished as the result of treatment, I think the advisability of an early tracheotomy cannot be questioned. This, I think, is shown in every case which I have related in which the tube became a permanent need, and also in every case in which the operation was done early in the disease, as, in these latter cases, with one exception, the result was a permanent cure, while in the former cases the operation was done only after the muscles had undergone complete atrophy. The operation is a very simple one, and unattended with any immediate danger. The untoward sequelæ which are liable to occur may be prevented by proper precautions. A delay is constantly endangering the integrity of the muscle, and too great a delay will surely render the operation imperative, but then only to be followed by the terrible necessity of wearing a trachea tube during life.

Among the cases detailed, I have given one in which the paralysis was due to epithelioma, and another in which it was an accompaniment of laryngeal phthisis. Of course, these two cases are not to be classified under the same category with those in which the paralysis is primary. The cases are given as illustrative of the manner in which the disease may occur as a secondary affection, and as a complication of local manifestations of cancer, phthisis, or syphilis in the larynx.

In connection with the indications for treatment already given, the use of the Faradic current should be resorted to as materially aiding to preserve the integrity of the muscular structures and restoring their contractility. The special methods by which this may be accomplished have already been sufficiently described in the previous chapter.

CHAPTER XXII.

TUMORS OF THE LARYNX.

The existence of tumors or polypi in the larynx was recognized as far back as the middle of the eighteenth century, and operations were resorted to for their removal. The diagnosis in these cases was based on the subjective symptoms and digital exploration. In occasional cases in which the growth projected above the laryngeal cavity, it was recognized by direct inspection. The operations for their removal consisted in opening the larynx from without; although in one or two cases their removal was attempted through the natural passages. Since Czermak, in 1859, first recognized a laryngeal growth by means of the laryngoscopic mirror, a very large number of these tumors have been observed, and successfully removed by means of some of the ingenious instruments which have been especially devised for the purpose.

The symptoms which point to the existence of a laryngeal growth are in the main of a purely mechanical character, and depend on the size and location of the neoplasm. If the attachment be to the vocal cords the voice is either lost by the interference with the closure of the glottis, or impaired by the interference with the vibration of the cords. If the attachment is to the commissure of the arytenoids, their closure is liable to be thereby prevented and the voice lost.

Dyspnœa is entirely dependent on the size and location of the growth. If the tumor is attached to the epiglottis it may cause painful or difficult deglutition. The cause of a laryngeal growth is probably, in most cases, a chronic catarrh; aside from this we are unable to recognize any direct cause. They occur in singers, public speakers, and those accustomed to make special use of the voice, more frequently than in others. Males are more liable to these occurrences than females, probably from the fact that they suffer more frequently from catarrhal

inflammations of the upper air-passages. They are most frequently met with in middle life, though they occur at every age, and are by no means infrequent in young children. Their attachment, in by far the largest proportion of instances, is to the vocal cords, though no region of the larynx is exempt. Laryngeal growths may be classified under the head of benign, semi-malignant, and malignant tumors.

Benign Tumors.

The benign tumors met with in the larynx are, *papillomata*, *fibromata*, *cystic tumors*, *myxomata*, *lipomata*, and *angiomata*.

Papillomata or warty growths are analagous to the ordinary wart which occurs on the finger, and are by far the most common of tumors, comprising nearly three-fourths of all laryngeal growths. In structure they resemble the normal papillæ, from which they receive their name. They have their origin in the connective tissue of the subepithelial layer of the mucous membrane which forms the basis of the growth, and are covered by a number of layers of epithelium. Occasionally blood-vessels and nerves are found composing a part of the mass. Their growth is somewhat slow, but they may attain a considerable size, to the extent often of producing no little obstruction to respiration. They are generally sessile in character, of a soft and friable consistence, and liable to be somewhat vascular. On inspection they present a grayish color with a somewhat irregular outline, having something of the appearance of the ordinary wart on the finger. In other cases they have a decidedly red color as the result of excessive vascularity. Their surface is usually studded with minute pointed projections or rounded masses, of an appearance somewhat like that of a cauliflower excrescence. Their most frequent site is the vocal cords, especially near the anterior extremity. Occasionally they arise from the commissure of the arytenoids, less frequently from the false cords or epiglottis. After removal they show a tendency to recur, when their development is far more rapid than before. Fig. 140 shows a papilloma attached to the left vocal cord. This cut very well illustrates the gross appearances of these tumors, and also the average size in which they occur in the very large majority of cases.

Fig. 141 illustrates a case in which the growth has attained a very unusual size.

Fibromata.—This form of growth is found in the larynx next in frequency to that of the papilloma. According to Mackenzie, about ten per cent. of laryngeal growths are fibromatous. In structure they consist of bundles of dense fibrous tissue interlacing in every direction. They contain but very few

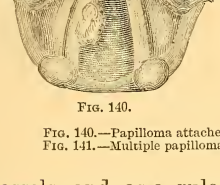

Fig. 140.

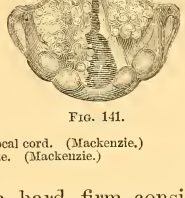

Fig. 141.

Fig. 140.—Papilloma attached to the left vocal cord. (Mackenzie.)
Fig. 141.—Multiple papilloma of unusual size. (Mackenzie.)

blood-vessels, and, as a rule, are of a hard, firm consistency. They have their origin in the submucous connective tissue. A fibrous tumor may present itself as a single rounded mass (see Fig. 142), or as a group of small tumors (see Fig. 143). In outline it is generally rounded and is covered with mucous membrane of a dirty white or red color. Its growth is extremely slow and it rarely attains to any great size. After removal there is

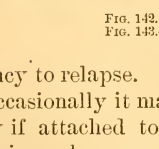

Fig. 142.

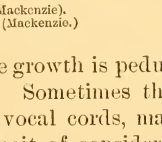

Fig. 143.

Fig. 142.—Single fibroma. (Mackenzie).
Fig. 143.—Multiple fibroma. (Mackenzie.)

no tendency to relapse. As a rule the growth is pedunculated, though occasionally it may be sessile. Sometimes the pedicle, especially if attached to one of the vocal cords, may become elongated in such a manner as to admit of considerable freedom of motion in the tumor. Their starting-point, in the majority of cases, is in the vocal cords. Occasionally they are met with attached to the false cords or epiglottis.

Cystic tumors.—These are among the rarer tumors of the

larynx and consist of small collections of fluid or semi-fluid material contained within a cyst-wall or capsule. In the larynx their source is in a distended follicle, probably, whose excretory duct having become closed, the normal secretion increases and distending the follicular wall, develops gradually into the cystic tumor. They grow very slowly, and rarely attain any great size, and when punctured and thoroughly emptied of their contents show little tendency to recurrence.

FIG. 144.

FIG. 145.

FIG. 144.—Cystic tumor attached to the epiglottis. (Mackenzie.)
FIG. 145.—Angioma springing from the hyoid fossa. (Mackenzie.)

Fig. 144 illustrates a case reported by Mackenzie, in which the cyst springs from the epiglottis.

Myxomata.—These are tumors composed mainly of mucous tissue, and have been met with in the larynx but twice, as far as I know; one case having been reported by Von Bruns and another by Mackenzie.

Lipomata, or ordinary fatty tumors, have been met with but once, the case being reported by Von Bruns.

Angiomata.—These tumors consist of enlarged and tortuous blood-vessels, held together by a small amount of loose connective tissue. In character they are analogous to the ordinary nævi of the skin. They have a bluish or purplish color, with something of the appearance of a blackberry. They are extremely rare. Fig. 145 illustrates a case reported by Mackenzie in which the mass springs from the hyoid fossa.

CHORDITIS TUBEROSA.

This is an affection of the larynx, which is sometimes described under the head of neoplasms. It consists in the development, on one or both of the vocal cords, of a small, rounded nodule or tuberosity.

Tuerck, I believe, first described this affection under the

name of chorditis tuberosa, which would seem a more appropriate name than that of a tumor. There is developed on the vocal cord, generally midway between the vocal process and its anterior insertion, a small, rounded projection, sessile in character and standing out from the free border of the cord, showing itself distinctly in profile on a laryngoscopic examination. It is of a grayish color, with a moderate amount of noticeable injection of the blood-vessels surrounding it. It develops very slowly, rarely attaining a size larger than a pinhead, and when developed, remains stationary as to size. There is usually seen on the opposite cord, at the point where the tuberosity impinges upon it in phonation, a corresponding depression, though in one case which came under my observation there was developed a similar condition on the cord of the opposite side, the tuberosities meeting in the median line during attempted phonation.

The source of this affection is a chronic laryngeal catarrh, leading to the development of a localized morbid process, probably in the connective-tissue layer of the mucous membrane, resulting in the condition above described. The symptoms to which it gives rise are confined entirely to the voice; there is no dyspnœa, no reflex spasm, no cough, as a rule, no pain, simply hoarseness or aphonia, resulting from mechanical interference with free vibration and proper approximation of the cords.

The affection is easily recognized, and a mistake in diagnosis need not occur. I have frequently seen a small globule of thick, tenacious mucus adhering to the vocal cord in such a manner as to accurately resemble the morbid condition above described. This disappears, of course, by simple cleansing by the spray or brush.

The treatment of this condition consists in the local application of a strong solution of nitrate of silver of the strength of fifty to sixty grains to the ounce; this should be applied by means of a small pellet of cotton wrapped on a slender laryngeal probe, in preference to either the brush or sponge. In this manner the application is nicely localized at the diseased point, while the surrounding tissue need not be touched, thus avoiding the spasm which strong solutions of nitrate of silver are so apt to excite when applied in the laryngeal cavity.

The Removal of Laryngeal Tumors.

The use of the laryngoscope which has rendered the accurate diagnosis of these morbid growths in the larynx possible during life, has also been followed by the invention of ingeniously constructed instruments, by means of which their removal is easily accomplished through the natural passages.

It is a question whether the simplicity and attractiveness of these so-called endo-laryngeal operations for the removal of tumors, have not induced many operators to resort to them when other and simpler methods of procedure might have been made use of, as in many cases, probably, small growths, the result of localized morbid processes, have been subjected to evulsion when local medication would have accomplished the desired end quite as satisfactorily and with probably far less injury to the delicate structures of the larynx; it is not, however, intended to deprecate the usefulness of the endo-laryngeal operation, or to deny that it is an immense advance in conservative surgery. The introduction, however, of this method of operation, was received with great enthusiasm, and was followed by an eagerness on the part of those who sought to establish a reputation in this special branch of medicine, to meet with a laryngeal tumor, and to cap the climax of their other achievements by removing it by the endo-laryngeal method.

Nicety and accuracy of manipulation is not always possible in removing laryngeal tumors, and in many cases, while the growth itself is removed, more or less of the healthy tissues are also torn away with consequent injury to the laryngeal structures. Hence, as before suggested, in the enthusiasm for operating it is probable that many cases have been subjected to unnecessary violence which might have been treated by simple local applications with equally good results, as regards the growth, and less injury to the healthy portions of the larynx. The instruments which have been devised are numerous. The general principle on which they are constructed is such that they can easily be passed within the laryngeal cavity, and by a simple and effective mechanism may be made to seize upon the tumor with the forceps, embrace it with a wire loop, or sever its attachment by the knife or guillotine. There

are two plans on which these instruments are constructed, that of the ordinary jointed forceps and the more elaborate tube forceps, so-called.

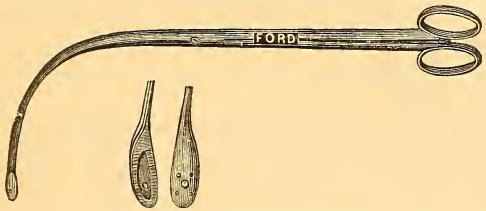

FIG. 146.—Tobold's laryngeal forceps.

Fig. 146 represents Tobold's forceps, an ordinary pair of long forceps with serrated edges and curved for passing into the laryngeal cavity. Fig. 147 represents Fauvel's forceps,

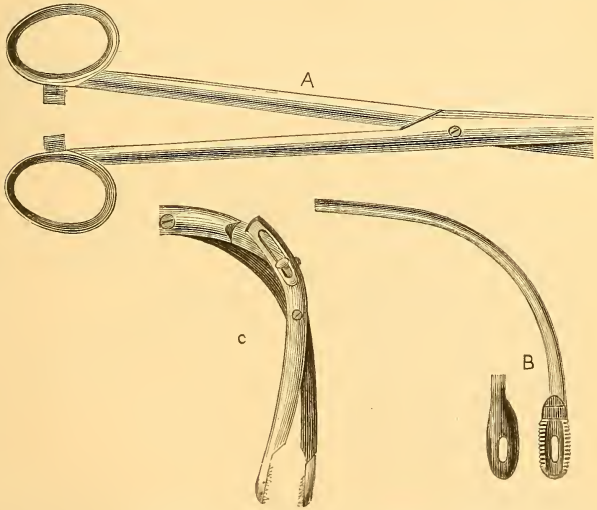

FIG. 147.—Fauvel's laryngeal forceps: A, handle, showing the method of locking the blades; B, lateral blades; C, antero posterior-blades.

constructed with a catch on the inner side of the ring handle, by which, after grasping the tumor, they are held in a closed position without further thought upon the part of the manipu-

lator. The bite of the instrument is also supplied with small teeth mounted upon one jaw and passing through openings in the other, intended to hold the growth more securely when once seized.

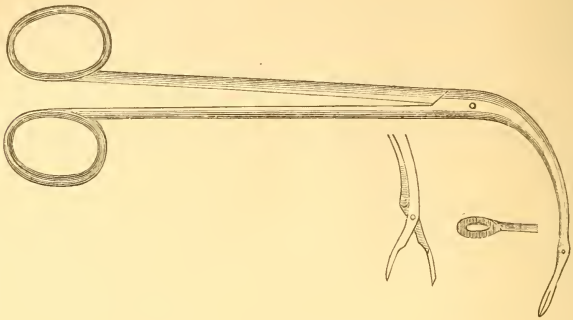

FIG. 148.—Cusco's laryngeal forceps.

Fig. 148 represents Cusco's forceps, which are constructed with a double hinge, so arranged that the jaws open near the distal extremity of the instrument. The advantage of this

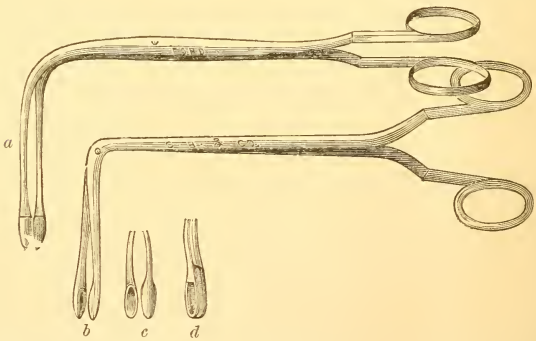

FIG. 149.—Mackenzie's laryngeal forceps: *a*, the lateral forceps; *b*, the antero-posterior forceps; *c*, spoon-shaped forceps; *d*, punch forceps.

mechanism is apparent. A very limited movement of the hand is necessary for the widest opening of the jaws of the instrument, hence less obstructed movement is obtained of the

point of the instrument during manipulation within the larynx. I have this instrument constructed with Fauvel's self-retaining catch on the rings, which add smuch to its usefulness. Mackenzie's forceps shown in Fig. 149, are constructed with a more abrupt angle and with some modifications of the jaws, otherwise, however, resembling the other instruments.

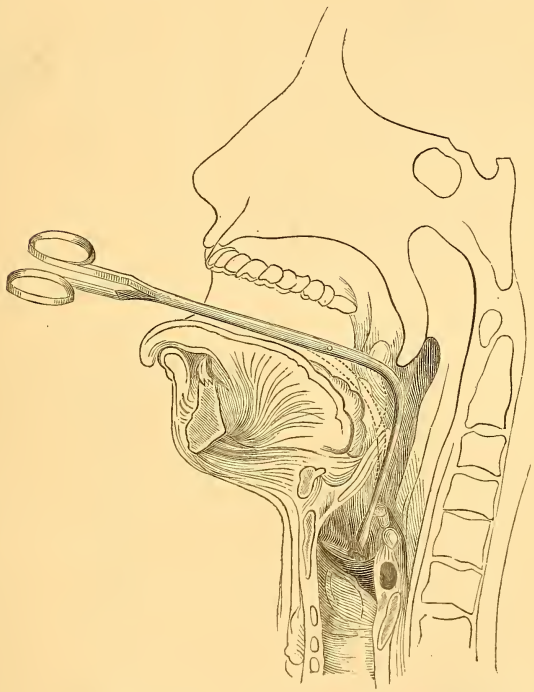

FIG. 150.—Mackenzie's laryngeal forceps in position. The dotted lines illustrate the position of the ordinary curved forceps. (Mackenzie.)

It is claimed by Mackenzie that the proper angle for the forceps is nearly the right angle. This is the principle on which his instrument is constructed, with the design of so fashioning it that it can be more easily introduced, and that it more perfectly escapes contact with the sensitive parts at the root of the

tongue when in situ. This is shown in Fig. 150. Any of these forceps may be constructed with the blades opening antero-posteriorly or laterally, to enable them to seize growths in any position of attachment. These jointed forceps possess every requisite of strength and efficiency for the removal of warty growths or pedunculated tumors, and will be preferred by most operators to the more delicately constructed tube forceps. The only objection which lies against them is, they are somewhat bulky and heavy for nice manipulation, and they are intended to seize and tear away the tumor which, of course, is only accomplished with a certain amount of injury to the surrounding healthy tissues. In Fig. 151 is shown Mackenzie's tube for-

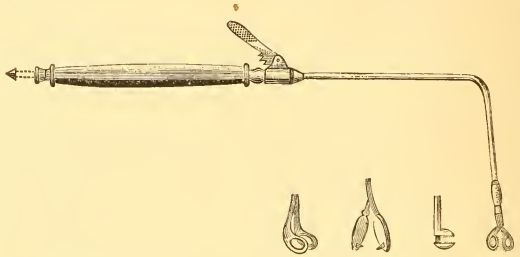

FIG. 151.—Mackenzie's tube forceps. Pressure on the lever forces the tube forward over the blades, thus bringing them together.

ceps, with the different mountings to adapt it for the varying size, character, and location of growths. Of all the instruments of this kind, this is probably the most efficient on account of the delicacy of its construction, the simplicity of its mechanism, and the ease of its manipulation. Its working will be understood by reference to the plate. Fig. 152 represents Stoerck's forceps. This is a somewhat more elaborate instrument of the same class, and is fitted not only with the seizing forceps of Mackenzie's instrument, but also with the guillotine for embracing polypi, and with the knife. It is somewhat more complicated than Mackenzie's instrument, is not so easy of manipulation, and not more efficient.

Fig. 153 represents Mackenzie's guarded wheel ecraseur, for use in the larynx, whose action explains itself. In general it may be said in regard to the removal of laryngeal growths, that the jointed forceps will be preferred in the majority of

cases, on account of the strength of the instrument and the certainty of its grasp. In the case of the larger tumors, such as large masses of warty growths, or fibroids, their removal will, as a rule, require the use of the blade forceps. In the smaller

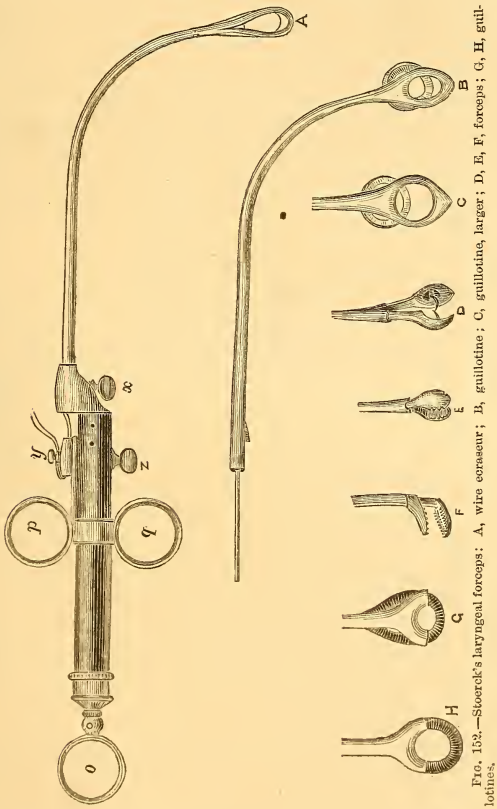

FIG. 152.—Stoerck's laryngeal forceps: A, wire ecraseur; B, guillotine; C, guillotine, larger; D, E, F, forceps; G, H, guillotines.

growths, especially those which are pedunculated, the tube forceps will receive the preference as admitting of a nicer manipulation, and enabling the operator to remove the growth with less danger of injury to the surrounding healthy tissues. The location, character, and size of morbid growths in the larynx,

vary so greatly, that it is difficult to lay down any special rules for their removal. Every physician, however, who has had any experience in the use of the laryngoscope, may safely trust his best judgment in the selection of the instrument best adapted for the purpose which he desires to accomplish. The great obstacle in the removal of tumors by the endo-laryngeal method, is the irritability of the throat. As a rule, the tolerance of the instruments requisite for the proper accomplishment of the manipulation, is only acquired after considerable training. It is absolutely necessary that the patient should hold his faucial muscles at perfect rest until the tumor is seized; of course, very few patients are capable of this amount of control, hence it will be necessary to subject them to daily practice in the

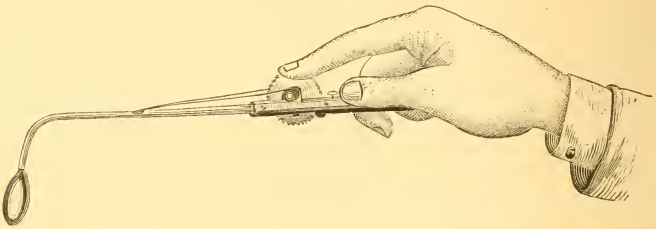

FIG. 153.—Mackenzie's guarded wheel ecrascur. The wire loop is concealed within the metal ring, to facilitate its management in the laryngeal cavity. After it is in place, the wire is drawn in by turning the wheel with the finger.

passage of a probe into the larynx until they submit to the contact of the instrument without retching. When this tolerance is acquired the operation is comparatively an easy one. The method of operating is simply to guide the point of the instrument by means of the mirror held in place by the left hand, the patient protruding the tongue and holding it in his right hand. With the greatest amount of training it often happens that the requisite tolerance is not acquired on the part of the patient, and in these cases the operator's special skill is brought into requisition. Having thoroughly examined the growth, and being satisfied as to its location and attachment, it becomes necessary that he should possess sufficient skill to pass the forceps down, and seize the tumor during the momentary confusion which results from the retching of the patient; that is, knowing the exact point at which he desires to engage the bite of the instrument, he proceeds with

the manipulation without the aid of the guidance afforded by ocular inspection through the laryngeal mirror. This method of operating is open to the objection of being unsurgical, but it is the method which is required in a proportion of cases; for, whereas the patient will submit to the passage of the probe which he knows is simply passed to accustom the larynx to its presence, he is extremely liable to become somewhat nervous when the forceps are passed, and will probably retch just at the instant when it will cause the most annoyance to the operator. From this consideration it is well to use the forceps as a laryngeal probe in training the patient, and furthermore, to conceal from him the time when the operation is to be attempted. Small warty growths or pedunculated fibroids can, as a rule, be removed at a single operation. The larger tumors, however, can only be removed piecemeal, and may often require a number of sittings. In those tumors which have attained a large size, and whose attachments are so extensive as to render their removal by the endo-laryngeal method difficult and hazardous, resort must necessarily be had to the external operation. This consists in opening the larynx by cutting through the thyroid cartilage according to the method to be described.

Before leaving the subject it may be well to remark that many attempts have been made to produce tolerance on the part of the laryngeal cavity of the introduction of instruments for the purpose of operating, by means of the local application of certain anæsthetic remedies, such as chloroform, ether, morphine, bromide of potassium, solution of tannin, alum, etc. What has been said already in regard to local measures for overcoming irritability of the fauces is true also of the larynx, viz., that we possess no method of attaining this result. The action of remedies so used is extremely uncertain, and even when anæsthesia is produced, it is largely through the systemic action of the drug; hence, as for instance in the use of morphine, there is danger of administering an excessive dose, and of getting too profoundly the systemic effect, before the local anæsthesia is produced. The only rule, therefore, which can safely be followed in the endo-laryngeal method of removing tumors is to study the character, position, and attachments of the neoplasm, calculate nicely the exact curve required in the instrument used to enable it to reach the point at which it

is desired to seize the mass, and then carry it quickly and unhesitatingly down, and by as rapid a movement as possible seize the tumor and remove it.

Rossbach's Operation.—In this connection there should be mentioned a rather novel method of removing tumors from the larynx, recommended by Prof. Rossbach, of Würzburg. The procedure is only applicable to cases in which the neoplasm is attached to the upper surface of the vocal cords. The operation consists in the introduction from without, into the cavity of the larynx, of a narrow-bladed, sharp-pointed, delicate knife, which is passed through the median lamina of the thyroid cartilage, a few millimetres below the notch, and exactly in the middle line. The operation is not painful and the patient is only conscious of the pricking of the integument externally. The point of insertion is so selected that the blade shall appear in the laryngeal cavity immediately upon the upper surface of the cords. The further manipulation of the knife consists in the severing of the attachments of the growth, and this is said to be easily accomplished by the aid of the laryngeal mirror.

The operation is an extremely simple one, is attended with no hemorrhage, the patient is unconscious of the presence of the knife in the larynx, and neither retching or cough is liable to be excited. It would seem that this operation might be eminently adapted for many cases, and might occasionally be preferred to either the endo-laryngeal method or the external incision.

Semi-Malignant Tumors of the Larynx.

But one class of neoplasms is embraced under this head, viz., sarcomata. The prominent clinical characteristic of these growths is their semi-malignancy, and hence the name is retained. They occur very rarely in the larynx. In the chapter on extirpation of the larynx five cases are reported in which this operation was performed for the removal of tumors of this class. They spring from the deep layers of the mucous membrane, or from the perichondrium, and extend slowly, but as a rule more rapidly than carcinomatous growths. They possess a marked tendency to infiltrate neighboring parts, hence they may not only encroach upon the cavity of the larynx, but may invade the adjacent tissues.

They may be encapsulated, in which case they present a somewhat rounded mass; or they may be without an investing capsule, in which case they are more diffuse. They are composed largely of certain rounded, fusiform, or myeloid cells, with an intercellular substance and numerous blood-vessels. The round-cell sarcoma is the most malignant in character; the fusiform or spindle cell tumor less so, and the myeloid the least malignant of all. The appearance of a sarcomatous tumor is by no means constant. It may present a rounded, smooth mass, resembling a fibroma, or a broadly diffused, irregular mass, not unlike a papilloma. The diagnosis is not easily made on laryngoscopic examination alone, but will be based largely on the location of the mass, its amount of diffusion, and the clinical history of the case. A certain diagnosis will only be attained by securing a small portion of the tumor, and examining it microscopically.

Malignant Tumors of the Larynx.

Cancerous growths develop not only primarily in the larynx, but also secondarily by extension from other organs. Of all neoplasms occurring in this organ a far larger proportion assume a malignant character than would be supposed, and it is not an unreasonable inference that the constant functional activity of which the organ is the seat, and the irritation to which any morbid process is subject, may have some possible influence in giving a malignant impetus to neoplastic development. Whatever may be the cause, however, of this disease, its comparative frequency is undoubted. The forms which malignant disease may assume are epithelioma and scirrhus, including under the latter the encephaloid form of cancer. A large proportion of cases can be traced to hereditary influence; occasionally we may trace their incipiency to traumatic causes; in others, no assignable cause can be given for their development. They may occur at any age from five to eighty, the majority of cases, however, occur between the ages of fifty and seventy. In general it may be stated that cancer in the larynx obeys the same laws as to causation, progress, and duration, as govern its

manifestation in other organs of the body. In looking up the reports of laryngeal tumors somewhat hurriedly, I find reported four hundred benign neoplasms and one hundred malignant tumors, which indicates the comparative frequency of occurrence of the two forms of growths. Of the malignant growths the epithelioma occurs with the greatest frequency. Perhaps in no location do cancerous growths display their essential malignity more markedly than in the larynx, for in their development they soon encroach both upon the œsophagus and the larynx, thus interfering with respiration and deglutition, cutting off from the sufferer not only food but air. They may occur as prominent circumscribed masses, but more frequently they are broadly diffused. They may have their origin in any portion of the cavity, as the vocal cords, ventricles, ary-epiglottic folds, etc.

Symptoms.—As the tumor develops, the symptoms which at first are extremely obscure become prominent, according to the character and location of the growth. The voice is liable to become affected very early, either from direct implication of the cords, or from the mechanical interference with their closure. This is followed soon by interference with deglutition, the mechanical impediment to the act being rather more prominent than any pain attendant upon it; this is especially true if the posterior wall of the larynx is involved. If the tumor be of the scirrhus or encephaloid variety, the mechanical obstruction to phonation and deglutition increases until the passage of solids becomes impossible. If the cavity of the larynx is encroached upon, dyspnœa soon becomes a prominent symptom. If the disease be of the epithelial variety ulceration is apt to occur early in its progress, when pain becomes the prominent symptom of the affection. The symptoms vary to such an extent, however, with the character and location of the disease that it is extremely difficult to base an opinion on the subjective symptoms. Secondary infiltration of the glands of the neck does not, as a rule, occur very early in the history of the affection; sooner or later, however, this is apt to occur, and there is presented that peculiar, hard, dense mass which is so characteristic of the secondary infiltration from malignant disease. Pain in the larynx, oftentimes of a sharp and lancinating character, is said to occur early; this I have not noticed. The impairment of the general health manifesting itself in

that peculiar facies which we call the cancerous cachexia, is among the later manifestations.

Laryngoscopic examination.—In epithelial cancer there will be brought into view the characteristic appearances of that form of growth, varying in size, location, and attachment, but when seen satisfactorily it is recognized with comparative ease, in the characteristic gray pultaceous mass. Occasionally the tumor is more of a reddish or rose color, presenting minute injected points. Oftentimes it presents no well-defined outlines, but simply shows itself as an irregular mass incorporated in one of the walls of the larynx, distorting and partially occluding its calibre. The mucous membrane surrounding it is somewhat injected and marked by enlarged blood-vessels leading up to the tumor. Its tendency is to early ulceration, in which case the ulcerated surface is simply characterized by a discharge, somewhat scanty in amount, of thick, tenacious, ropy mucus.

The diagnosis is not always easy on direct inspection, and yet it can be much aided by excluding syphilis and papillomata. From syphilis it is easily distinguished by the absence of those appearances which characterize syphilitic ulceration, as the excavated ulcer, sharp-cut edges, reddened areola, etc. From papilloma it is distinguished by the injected blood-vessels leading up to it, by the peculiar color of its surface, the minute red papillated projections, by its soft pultaceous character, and its tendency to hemorrhage, together with the involvement of the cervical glands and the general condition of the patient. In encephaloid cancer there is presented one or more rounded masses embedded beneath the mucous membrane of some portion of the laryngeal cavity which it displaces. It usually shows a number of highly injected blood-vessels coursing over its surface, and is attended with more or less diffuse infiltration of the lining of the larynx, so that the laryngeal cavity is not only encroached upon by the tumor, but is also markedly distorted and misshapen by the diffuse infiltration. It is oftentimes extremely difficult in the early stages of this affection to make a differential diagnosis between it and syphilis, and the decision will rest largely on the clinical history of the case and the subjective symptoms. As these tumors develop, however, they are apt to undergo, at one point or another, ulcerative action, when the appearances become quite

distinct from those of syphilis. There is the absence of those appearances which are described as characterizing deep ulceration of syphilis, and in place of which there is seen, in connection with the more or less extensive and deforming tumors and infiltration, points of ulceration characterized by a certain amount of loss of tissue, with, however, no excavation, a moderate amount of discharge with no areola. The course of the cancer is to progress slowly and to produce death by apnœa, unless relief is given by tracheotomy, in which case death finally occurs from exhaustion, the average duration of the disease being three years.

Treatment.—These tumors have been removed by the endolaryngeal method, in which case, occasionally, the disease seems for a time arrested. It almost invariably, however, recurs, and the only result of the operation is temporary relief. Local measures for the removal of the accumulated secretions and the relief of pain, are of the greatest benefit, and should never be neglected. These consist in the application to the diseased surface, by means of the laryngeal spray, of one of the cleansing solutions given in the Appendix, followed by the application of iodoform, if ulceration exists, in connection with anodynes, of which preference should be given to morphine, either in powder or solution. Mild astringents are of benefit in controlling the secretions from the mucous membrane surrounding the tumor, and add much to the comfort of the patient. Tracheotomy, of course, should be resorted to as soon as dyspnœa sets in. The question of operation should be considered only with reference to such temporary benefit as may accrue to the patient from it. Meddlesome interference with the malignant tumor oftentimes may result in serious injury, and it becomes a question whether the comfort of the patient is not served better by mere palliative local treatment, which will often be attended with most excellent results, than by the attempt at removal, which can only be partially successful and which is attended with the danger of exciting renewed activity in the growth by which it may recur and develop far more rapidly than before. The question of the more radical treatment, by the extirpation of the larynx, will be discussed in another chapter.

CHAPTER XXIII.

ARTIFICIAL OPENINGS INTO THE AIR-PASSAGES.

It is not intended to enter upon any lengthy consideration of all the surgical procedures which may be resorted to in the region of the larynx, but in as brief and concise a manner as possible to describe those operations which consist in opening the upper air-passages from without, in connection with the special indications for their performance. These operations consist of, *laryngotomy*, *laryngo-tracheotomy*, *tracheotomy*, *thyrotomy*, and *subhyoidean pharyngotomy*. The upper air-passages are opened by one of the above operations for the purpose of removing tumors or foreign bodies, and to relieve dyspnœa, the selection of the special operation being governed by the characteristics of the object to be obtained. The last two operations enumerated are performed for the sole purpose of removing neoplasms and foreign bodies, or to remove the results of morbid conditions which interfere with respiration or phonation, such as cicatrices from syphilis, resulting in stenosis, etc. These operations, of course, are only resorted to in those cases in which the endo-laryngeal operation presents obstacles too great to be surmounted. Laryngotomy, laryngo-tracheotomy, and tracheotomy, are performed for the purpose of relieving dyspnœa, though occasionally for the removal of foreign bodies or tumors.

The anatomical points (see Fig. 154) to be remembered in connection with these operations are as follows : The larynx and trachea lie somewhat superficially in the neck, covered with the integument and the superficial cervical fascia. From above downwards we have the thyroid cartilage, crico-thyroid membrane, and the trachea, the second and third rings of which are covered by the isthmus of the thyroid gland. The thyroid cartilage with the thyroid notch is easily recognized by the

touch immediately beneath the skin. From three-fourths of an inch to an inch below the thyroid notch or Adam's apple, is felt a slight depression which indicates the position of the crico-thyroid membrane. Immediately below this is felt the cricoid ring surmounting the rings of the trachea.

The crico-thyroid membrane is traversed by the crico-thyroid artery, a small artery whose division occasionally gives rise to troublesome hemorrhage. In front of the trachea lie the sterno-thyroid and sterno-hyoid muscles whose anterior edges approximate in the median line. Beneath these and at the sides of the trachea lie the anterior jugular veins, approximating above and diverging below to pass beneath the sterno-mastoid muscles; they are occasionally connected by a transverse branch. The cutting of these veins is to be avoided, as a considerable hemorrhage might result.

The isthmus of the thyroid gland lies upon the second and third rings of the trachea, and is covered by a plexus of veins which converge below to a single vein, which descends in front of the trachea, and empties into the innominate vein. Immediately above the isthmus is found the transverse communicating branch between the superior thyroid veins.

Laryngotomy.

Laryngotomy consists in making an opening through the crico-thyroid membrane, and is the simplest and easiest of all the operations. The method of performing it requires no lengthy description. The head being bent well back, and the crico-thyroid space being located, an incision in the median line of an inch to an inch and a half in length is made, and the membrane divided by an opening sufficiently large to admit the introduction of a tube. The operation is attended with no especial dangers or difficulties other than the division of the crico-thyroid artery, which, however, usually gives rise to but trifling hemorrhage. If the operation is done merely for temporary relief to laryngeal obstruction, it is the one to which preference should be given. If, however, the patient requires that the tube should remain in situ for any lengthened period of time, there is danger of its not being well tolerated, as ulceration and necrosis of the cricoid cartilage might ensue.

Laryngo-Tracheotomy.

This operation consists in opening the air-passages by means of an incision through the cricoid cartilage and upper ring of the trachea. Its method of performance is much the same as in laryngotomy. The regional anatomy of the parts having been determined beforehand, the incision through the integument is carried somewhat lower down, and the cartilages having been laid bare, are cut through by means of a sharp-pointed bistoury plunged between the first and second rings of the trachea and carried upward until the cricoid ring is cut through. One of the dangers or difficulties attending the operation is the occurrence of hemorrhage from the communicating branch between the superior thyroid veins, from which troublesome or even dangerous bleeding may arise. In addition to this the proximity of the thyroid gland is such, that it is extremely liable to be cut during the operation, becoming an additional source of what may be an extremely troublesome hemorrhage.

Tracheotomy.

This operation consists in opening two or three rings of the trachea below the isthmus of the thyroid gland. The method of performing it is as follows: The head being thrown well backward, by which the trachea is made as prominent as possible, an incision is made carefully in the median line from the cricoid cartilage downward to the extent of two or two and a half inches. The integument and superficial fascia having been cut through, the next step of the operation should be to expose the trachea as far as possible by the use of the handle of the scalpel and fingers, crowding to one side the anterior jugular veins and the border of the sterno-hyoid muscles, and removing the loose areolar tissue, and crowding to one side also the inferior thyroid veins. The trachea having been exposed, it is incised from below upward by a sharp-pointed bistoury and the tube inserted. The dangers of this operation lie in the possible injury of the thyroid isthmus which may be found lying low down on the trachea, and the cutting of the thyroid

veins which might result in excessive or troublesome hemorrhage.

Fig. 154 will show the relative position of the parts, and the course of the vessels with reference to these various operations.

Instruments Used.—For the simple operation in tracheotomy, there is required only a scalpel and a tube, together with towels, sponges, and tapes. A fully furnished tracheotomy set, however, should contain scalpels, a sharp and probe-

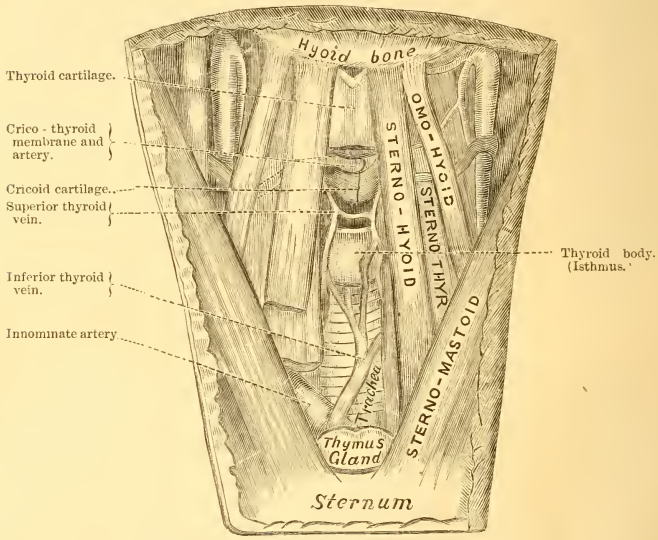

Fig. 154.—Surgical anatomy of the laryngo-tracheal region. (Gray.)

pointed bistoury, artery forceps, tenaculum, retractors, a supply of tubes of different sizes, and sponges, tapes, and feathers.

Cutting instruments include an ordinary-sized bistoury for making the incisions down to the trachea, after which the rings should be cut through by means of a sharp-pointed bistoury, a probe-pointed bistoury being at hand for the purpose of enlarging the opening, if necessary ; for while, of course, this can be done by the sharp-pointed instrument, the former is safer.

The retractors shown in Fig. 155 are of service in holding open the wound, especially if the trachea lies deeply; these, of course, are held by an assistant. The tenaculum serves the purpose of holding the trachea steadily while it is being opened. The tracheal dilator is for the purpose of dilating the tracheal opening to facilitate the insertion of the tube.

Fig. 155.—Pilcher's tracheal retractor.

Various forms of this instrument have been devised by La Borde (Fig. 157), Hutchinson (Fig. 158), and others, none of which probably are more efficient than the original instrument of Trousseau (Fig. 156).

After the trachea has been opened, the selection of the tube and its proper introduction is, perhaps, as important a feature

Fig. 156.—Trousseau's tracheal dilator.

Fig. 157.—La Borde's tracheal dilator.

of the operation as any other. The original trachea tube consists of a metallic cylinder bent to complete the quadrant of a circle and fitted with a collar at its cervical end. This collar is provided with small openings on each side into which tapes are inserted and passed around the neck and tied, thus holding the tube in position. This is the instrument shown in Fig. 159, and is generally known as Trousseau's canula. The collar is

fastened firmly to the tube, so that in the movements of deglutition, the trachea being raised together with the tube, the collar is apt to chafe the borders of the wound. A modification of this tube was made by Roger, a French surgeon, which consists in making the collar movable, thus enabling the trachea

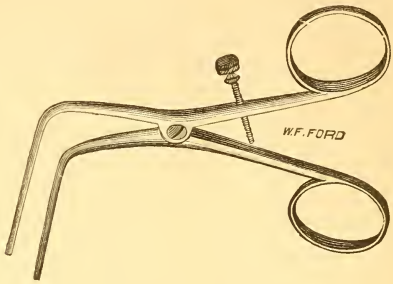

Fig. 158.—Hutchinson's tracheal dilator.

tube to move with the movements of the trachea while the collar lies firmly against the neck (see Fig. 160). This is accomplished by fitting around the cervical end of the tube a loose neck-plate which is held loosely in position by two flanges

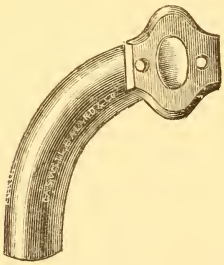

Fig. 159.

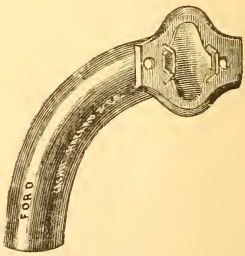

Fig. 160.

Fig. 159.—The original Trousseau tracheal canula, a single tube with immovable necklet.
Fig. 160.—Roger's tracheal canula, a single tube with movable neck-piece.

passing over small projections from the narrow collar fastened directly to the tracheal tube itself. In addition to this movable neck-plate, another improvement was made by M. Ober, which, perhaps, is the most important of all, and which consists in supplying an inner tube which can be taken out at will,

in order to remove accumulations of mucus, while the outer tube remains in position. There is thus avoided the inconvenience and oftentimes danger of the removal of the single tube for cleansing purposes, which becomes absolutely necessary at times. This double tube with the movable neck-plate is the instrument now generally used, and in most cases leaves little to be desired (see Fig. 161). A number of devices have been suggested, and changes made since the invention of this tube, prominent among which is that of Durham (Fig. 162). The important feature of this tube consists in making that portion of it which lies in the wound straight, while the tracheal end is bent somewhat abruptly to a right angle. At the same time, in order to adapt it to the varying depth of the trachea beneath the integument, it is so arranged that the position of the neck-plate can be changed, thus altering the length of the straight portion of the tube, and adapting it for any case, whether the trachea may lie deeply or superficially. When the proper position of the neck-plate is arrived at, it is fastened by a screw shown in the figure. Of course this right-angled outer tube requires that the inner tube, in order to allow of insertion or removal, shall be flexible. This is accomplished by making the tracheal end of the inner tube jointed lobster-tail fashion as shown in Fig. 163.

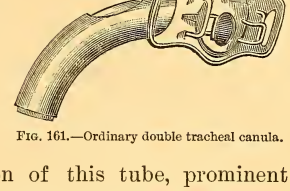

Fig. 161.—Ordinary double tracheal canula.

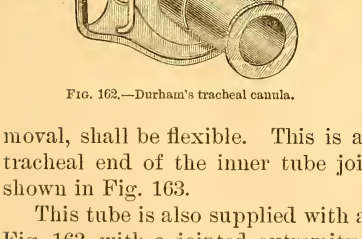

Fig. 162.—Durham's tracheal canula.

This tube is also supplied with a pilot trocar, shown also in Fig. 163, with a jointed extremity, to aid the introduction of the tube into the trachea. Theoretically, Durham's tube is undoubtedly a great improvement on the ordinary form. The great advantage of it is, that in the movements of deglutition the tube moves upward in the axis of the trachea, carrying with it the tracheal end, which is thus prevented from tilting against its posterior wall, which so often becomes a source of

irritation or ulceration in wearing the older form of tube. Another very great advantage is in the movable neck-plate, which renders it possible to nicely adjust the tube to the varying thickness of the cervical tissues, and thus enables it to be placed in such a manner that the tracheal opening reaches the trachea and no further. The objection to Durham's tube is in its jointed inner canula, which presents crevices for the lodgment of mucus, so that it easily becomes clogged. There is also a danger that the segments may become detached and drop into the trachea. In addition to this, the removal and reinsertion of the outer tube, after the wound in the neck has closed around it, is attended with some distention of the parts which renders it necessary to crowd it to such an extent that hemorrhage may be excited. In Trousseau's tube, by passing it exactly in the line of the circle of which it forms a quad-

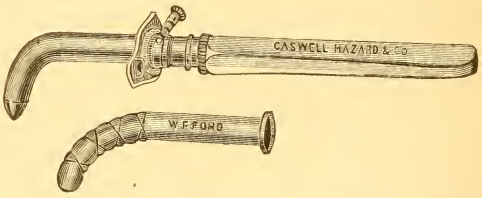

FIG. 163.—Pilot trocar and inner canula for Durham's tracheal canula. The trocar is shown with the canula upon it.

rant, no lateral pressure whatever is exerted, and the tube is removed and reintroduced with perfect ease, and without exciting pain or hemorrhage. With the Durham tube, on the other hand, which is passed through a straight opening until it reaches the trachea, its convexity crowds upon the upper wall, while its tracheal extremity scrapes along the floor of the wound until it reaches its position.

Another modification of the tracheal canula is Fuller's bivalve tube. This consists of an ordinary canula in which, however, for the outer tube there is substituted two lateral plates which may be brought into close proximity or separated to any distance by means of a screw attached to the cervical plate. The plates being brought into close apposition before insertion, and when fairly within the trachea, they are separated to any desired distance in order to receive the inner tube. The advantage of this tube is the great facility of its introduction,

and also that it is adapted to receive various sizes of the inner tube. The great objection to Fuller's device is the danger of the sharp edges of the movable plates cutting the tissues and exciting hemorrhage. A number of such accidents have been reported as occurring from the use of this tube. A similar device is that of Gendron, shown in Fig. 164. In this instrument the outer tube is split into two lateral plates. The main object of this is to enable the operator to press together the extremities of the plates and thus facilitate its introduction. After it has been passed into the trachea, the plates are crowded apart by the introduction of the inner tube. This instrument is open to the same objection as that of Fuller.

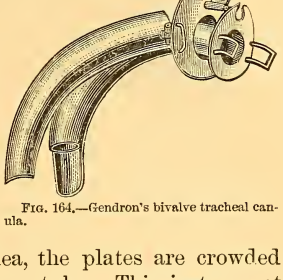

FIG. 164.—Gendron's bivalve tracheal canula.

An oval opening is oftentimes made on the upper side of the convexity of the trachea tube to enable the patient to breathe through the natural passages, or to talk. This opening is usually made in the outer tube alone; it is, however, not only a useless, but an objectionable feature, as the edges of the opening are liable to press against the walls of the trachea, giving rise to ulceration. It is useless, also, for the reason that the canula should never fill the calibre of the trachea, and, as a rule, never does, so that an abundance of space is left between the walls of the trachea and the sides of the tube for the passage of air, and the tube will interfere to no greater extent with respiration or phonation, than does the condition which has demanded tracheotomy. The tube should be made of virgin silver or German silver. The use of vulcanite which has come much into vogue of late years in the manufacture of tracheal tubes, is much to be deprecated. The only advantage of a rubber tube is in its cheapness; the objections to it are that it is bulky, thereby requiring a larger opening than would be required for a silver tube of the same calibre. It is also fragile, and this is the greatest and the most serious objection to it. The mucus which accumulates about its tracheal extremity is liable to make its way between the inner and outer tube, where, drying, it adheres closely and oftentimes renders the extraction of the inner tube for cleansing purposes

difficult, and in the effort at removal the tube is liable to be broken. Its cheapness will retain it in common use, however; it should therefore be watched with care and accidents prevented by frequent cleansing both of the inner and outer tubes.

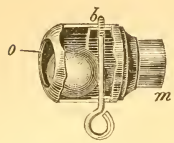

FIG. 165.—Luer's ball valve with side removed. *m*, mouth which fits into the end of the tracheal canula; *b*, wire to limit the movement of the ball; *o*, orifice.

In many cases, and especially those in which the tube is necessarily worn for a long time, some device by which the current of air in expiration may be directed through the natural outlet, is of great advantage. The object of this is, that talking may be possible without the necessity of placing the finger over the opening in the tube, and also that coughing and expectoration may have natural outlet through the mouth. Fig. 165 illustrates Luer's valve, which is for insertion into the cervical end of the trachea tube. It contains a small ball, which in expiration is driven forward and closes completely the opening, while in inspiration it falls back against the wire, shown in the figure, and allows of the free ingress of the current.

Tracheotomy is very frequently demanded in pressing emergencies, and many lives have been sacrificed from the fact that the sudden call has found the surgeon unprepared.

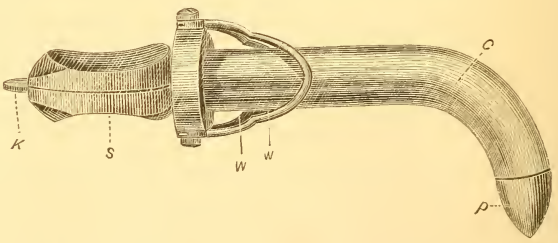

FIG. 166.—Mackenzie's pocket canula, with pilot trocar inserted: K, knife inserted in the pilot; S, slit in handle, which opens for withdrawal of the knife; W, W, wire flanges which serve the purpose of the cervical plate, and which fold back against the sides of the tube.

With a view to such emergencies, Mackenzie has devised a very compact tracheal canula, supplied with a pilot trocar, which contains also a scalpel. For the cervical plate there is substituted two wire flanges which can be bent back against the sides of the tube. (See Fig. 166.) The whole comprises a

simple affair which can easily be carried in the vest pocket. Fig. 167 shows the inner construction of the pilot trocar.

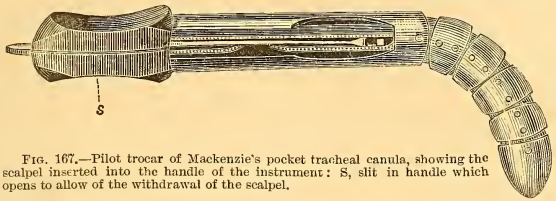

FIG. 167.—Pilot trocar of Mackenzie's pocket tracheal canula, showing the scalpel inserted into the handle of the instrument: S, slit in handle which opens to allow of the withdrawal of the scalpel.

While a knife is, as a rule, always at hand in an emergency, the lack of a tracheal tube is often the source of serious embarrassment. Dr. Benjamin Howard, formerly of New York, describes in *The Medical Record*, November, 1871, an ingenious canula which he had improvised and used successfully in a sudden emergency. The method of preparing the tube as directed by Dr. Howard is as follows:

"Take a piece of lead, whether in the form of sheet, pipe, or bullet, and, if necessary, hammer it out as thin as it can be used without breaking. Of this cut a piece the shape of a parallelogram, and about two and a half by one and a quarter inches, or enough to allow a margin; roll it around a trimmed stick, ramrod, or pencil, thus making a tube as in Fig. 168, and bevel both edges so that by trimming and dressing the seams may be smooth and firm. Cut the upper end so as to form four slips of equal size, *b*, *b*, and at about the middle of the tube cut out a transverse elliptical section from about two-thirds of its circumference (Fig. 168 *c*). Withdraw the pencil, and bend the tube upon itself. Turn down the slips, and in two of them cut eyelet holes, through which a string or tape may be passed around the neck to retain the canula in its position in the wound." The finished tube is shown in Fig. 169.

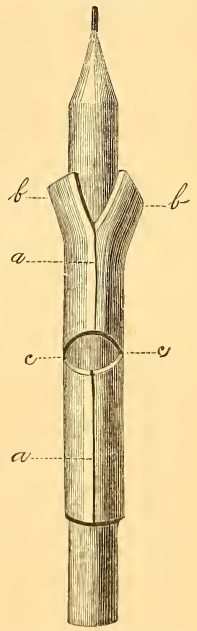

FIG. 168.—Preparation of Howard's improvised tracheal canula from a sheet of lead rolled around a pencil: *a*, *a*, bevelled seam; *b*, *b*, flanges for the formation of a cervical plate; *c*, *c*, piece incised to allow of bending the tube.

Anæsthesia.—A difference of opinion exists as regards the advisability of the use of anæsthetics in the operations for opening the upper air-passages. Some writers condemn the use of general anæsthesia, giving preference to the local methods by the ether spray, rigolene, etc., while others advise its use on the ground that a more perfect control of the patient is thereby secured and those annoying movements of the trachea avoided which so often interfere with the operator. My own preference is very decided for the use of chloroform or ether in tracheotomy. A very limited amount is required, especially if cyanosis exists to any extent, for in that case the patient is partially anæsthetized by the carbonic acid retention.

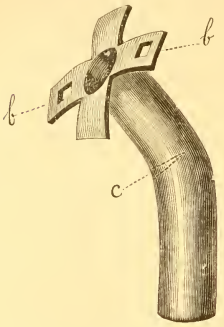

Fig. 769.—Howard's improvised tracheal canula: *b*, flanges and eyelet holes; *c*, elliptical opening closed by bending the tube.

It has been also urged against anæsthesia that the blood which may flow into the trachea during the operation is not expelled; this is not a valid objection, as reflex irritability is not entirely destroyed, but there is sufficient remaining, as a rule, to cause expulsive effort on the part of the patient. And again, the operation at the time this occurs has been finished or should be, and even if anæsthesia has been complete, he will have rallied somewhat by the time the trachea is fully exposed, and from that time until the introduction of the tube should, in the hands of a skilful operator, be but a very brief space of time.

In regard to the selection of the anæsthetic agent, with deference to the well-grounded American prejudice against the use of chloroform in ordinary surgical proceedings, it would seem to afford a safe and reliable agent, and one in every way to be preferred in operations about the upper air-passages.

As a rule, in these operations a certain amount of dyspnœa exists already, resulting in more or less cyanosis; hence, before any anæsthetic is administered, a partial anæsthesia exists so that a very limited amount is required. Chloroform is speedy in its action, is not irritating to the mucous membrane, rarely causes vomiting or retching, and the only objection lies in the possible dangers of its administration. Ether,

on the other hand, requires the administration of a larger amount, requires a longer time for the production of anæsthesia, is extremely irritating to the air-passages, exciting cough and other reflex symptoms, is liable to excite nausea and vomiting, and also causes that movement of retching by which the trachea and larynx is drawn up and down in a spasmodic way, as it were, thus greatly interfering with the surgeon's manipulations. For these reasons it seems to me that the use of chloroform is not only fully warranted, but might be safely recommended in preference to ether.

When the symptoms which demand tracheotomy become extremely urgent, the time required to administer an anæsthetic would be too valuable time lost; in these cases the operation should be proceeded with immediately and without such delay.

Hemorrhage.—Arterial hemorrhage may occur from section of the crico-thyroid artery; this, however, is usually but trifling in character; it may also occur from the thyroidea ima, but rarely of sufficient extent to cause serious trouble. Wounds of the innominate or carotid arteries are among the accidents that have occurred in the performance of tracheotomy, but it would seem that such an accident could only be the result of the grossest carelessness.

Venous hemorrhage, however, from the inferior or superior thyroid veins, or from the accidental wounding of the thyroid isthmus, will oftentimes prove exceedingly troublesome or even dangerous; especially is this true if marked cyanosis exists as the result of extreme dyspnœa. In these cases the blood wells up apparently from all sides, filling the cavity of the wound so rapidly as to prevent recognition of the source of the bleeding. Of course if the case is not an urgent one, and the source of the hemorrhage can be detected, the vessels should be tied. It is usually laid down, as a rule, not to cut into the trachea until hemorrhage has been arrested, in order to avoid the danger of blood making its way into the air-passages. This rule cannot be followed in all cases, and oftentimes it becomes absolutely necessary to proceed with the operation without reference to the hemorrhage. Guiding the manipulations, therefore, with the finger, it is justifiable and even obligatory, if the symptoms are urgent, to open the trachea and insert the tube as rapidly as possible, even though the wound is filled with welling blood. The result of this is, of course, that more

or less blood escapes into the trachea; this, however, can be obviated by immediately turning the patient with the face downward and the body inclined, at the same time holding the tube in position by the hand, and closing the wound as firmly as possible around the tube. The escape of blood which has thus gotten into the trachea will be facilitated, and the hemorrhage will soon be arrested. Tracheotomy may be one of the simplest of operations, or it may be an extremely formidable one; and there is nothing which so complicates it or renders it difficult as the occurrence of this excessive hemorrhage confusing the operator, and masking and concealing the tissues operated upon, and it is only by the exercise of coolness and decision that these difficulties can be surmounted. Hemorrhage, however, is not the bugbear that it is usually regarded, as all the difficulty which it causes will usually disappear under the exercise of promptness in proceeding with the operation, and finishing its steps rapidly where urgency exists or where the possibility of reaching the source of the bleeding for the ligation of vessels is impossible.

With the view of preventing the entrance of blood into the trachea during the operation of tracheotomy, Dr. Hanks, of New York, has devised a tracheotome (Fig. 170), which he describes as follows: "The instrument consists of a curved, hollow, sharp-pointed trocar, with handle (also hollow) attached—the whole about three and a half inches in length. It is made to fit exactly the larger of the set of tracheotomy tubes. In operating, the better way will be to cut down upon the trachea, which must be held firmly with the tenaculum, when the trocar with the canula is forced through between any two of the rings of the trachea, after which the trocar may be withdrawn and the canula left in situ. The advantages of this device are: 1st, but little blood can enter the trachea during the operation; 2d, the patient is supplied with fresh air directly upon the trocar penetrating the trachea."

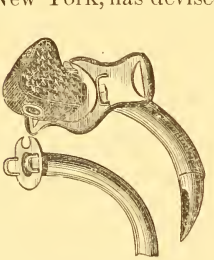

Fig. 170.—Hanks' tracheotome.

Exposure of the Trachea.—After the topical points have been accurately located, viz., the thyroid notch, crico-thyroid space, etc., the exposure of the rings of the trachea is not usu-

ally a difficult matter. Yet if the patient has a stout, thick neck, or if any tumor exists, or infiltration of parts which may crowd it out of the median line, very grave difficulties are sometimes added to the operation. In reaching the trachea the knife should be used as sparingly as possible, preference being given to the handle of the scalpel and finger in crowding the tissues to one side, provided no emergency exists which requires rapidity of the operation. As the incision deepens the edges of the wound should be drawn back by the retractors (Fig. 155) in the hands of an assistant.

Opening the Trachea.—When the trachea is reached, it should be seized with a tenaculum and drawn forward, thus steadying it, and enabling the operator to make the incision accurately in the median line, and sufficiently large to admit of the tube. Care should be exercised in cutting the rings, not to carry the point of the knife to the opposite side of the trachea, thus wounding parts which it is desired to leave intact. Cases have occurred where the opening has been made not only through the anterior wall of the trachea, but through its posterior wall and that of the œsophagus, the knife being carried down until it struck the vertebra. The point of the knife should be carried well through the tracheal wall and its mucous lining also, as the mistake has occurred of cutting through the tracheal rings only, the mucous lining being carried before the knife in such a way that when the tube was introduced the mucous membrane was pushed before it and complete occlusion of the trachea resulted for the time. If the operation is done with an abundance of light and prompt assistance, the physician will be able to see the steps of his operation and recognize exactly what has been accomplished. As the trachea is cut through the escape of air will dilate very moderately the opening and reveal the extent to which the incision has been made. Of course if hemorrhage occurs and urgency has compelled the operation to be finished beneath the blood welling out of the wound, the only guide will be the finger.

The Introduction of the Tube.—This would seem to be the simplest step of the whole operation, and yet it may prove oftentimes an extremely difficult one. Cases have been recorded in which the tube has been thrust into the areolar tissue surrounding the trachea in place of the tracheal opening. To facilitate the passing of the tube, Trousseau's forceps (Fig.

156) are usually recommended. This instrument consists of a two-bladed pair of forceps, with diverging extremities, which are introduced into the tracheal wound for spreading its edges. La Borde has modified this by constructing a trivalve dilator as shown in Fig. 157, though what purpose the extra blade serves it is difficult to perceive.

Fuller's or Gendron's bivalve trachea tubes are extremely easy tubes for introduction, but open to the objections already noticed. The pilot trocar shown in Fig. 171, very materially simplifies the introduction of the tube, but, of course, it is necessary that every sized tube should have a separate trocar; hence, unless one has a very liberally furnished case of instru-

Fig. 171.—Pilot trocar for inserting the ordinary tracheal canula.

ments, the trocar to fit the special instrument which he designs to use is liable to be wanting. Ordinarily, however, the canula will be introduced with comparative ease, and without a dilator or trocar, simply carrying the tracheal end of the tube on the forefinger as a guide, provided, of course, that the tracheal opening is sufficiently large.

Selection of the Site for Operation.—It is difficult to lay down any definite rules as regards the operation to be performed: it is usually taught, however, that the trachea should be opened below the isthmus of the thyroid, in preference to the higher operation. This is the more difficult operation, but it is less liable to be followed by ill effects afterward, it is said. The nearer the operation is to the vocal cords the greater the danger of impairment of the voice. This is undoubtedly an over-estimated danger. While, then, every case must be judged by the special incidents attending it, it seems to me that taking into consideration the simplicity of the operation, the rapidity with which it may be done, and the fewer complications that may attend it, that we might with safety more frequently resort to the higher operation. This is especially true if the operation is merely to relieve a temporary laryngeal obstruction.

If, however, there is a probability that the tube will need to be worn for any great length of time, the opening should be made below the isthmus, viz., tracheotomy.

THYROTOMY.

This operation is only resorted to for the removal of neoplasms or foreign bodies, and consists simply in opening the laryngeal cavity by an incision through the cricoid ring, cricothyroid membrane, and the thyroid cartilage, thus splitting open as it were the larynx in the median line in front, and drawing apart the alæ, exposing the laryngeal cavity. In many cases of tumors whose attachments are so broad or which are so extensive in character that the endo-laryngeal operation becomes an extremely difficult one, this operation will necessarily be resorted to. Especially is this true of cancerous tumors, or tumors in small children in whom the proper training becomes next to impossible, to prepare them for the endo-laryngeal operation. In these cases the only resort lies in opening the laryngeal cavity in the manner above noted. The operation is comparatively a simple one, and attended with no great danger. It gives free access to the cavity of the larynx and enables the operator to dissect out growths and remove them with a nicety and thoroughness which cannot be easily obtained by the endo-laryngeal method. Yet it should not be resorted to, of course, unless the obstacles in the way of the performance of the simpler operations are too great to be overcome, as there is great danger of causing serious injury to the vocal apparatus, and even permanent impairment of the voice, if this has not already occurred, as the result of the morbid condition which the operation is designed to remove. The patient should be placed in Rose's position, with the head drawn over the edge of the table, and in such a manner that the tissues of the neck are placed on the stretch, thus throwing the larynx and trachea well forward in the neck, and in such a position that the axis of the trachea is inclined toward the head. The object of this position, of course, is, that in opening the air-passages, any blood that may flow will pass into the mouth instead of trickling down the trachea. The anatomical points having been located, an incision is made from the cri-

coid cartilage to the hyoid bone. The laryngeal cartilages having been exposed, a sharp-pointed bistoury is inserted below the cricoid cartilage, and the ring cut through, and the incision carried upward in the median line until the thyroid cartilage has been severed. This can ordinarily be accomplished by a simple bistoury. If the patient is advanced in years, a stout pair of pliers should be at hand with which to make the incisions, in case the cartilages should be found ossified or the incision of the knife interfered with or prevented from any other cause. The laryngeal cavity having been thus opened, the wings of the thyroid cartilage can easily be drawn apart and the whole cavity exposed, thus enabling the operator to proceed with the subsequent steps of the operation, according to indications. An anæsthetic, of course, should be administered.

Thyrotomy is occasionally done subsequently to tracheotomy or laryngotomy, the earlier operation having been performed for the relief of dyspnœa, and the indications for the later operation being the removal of the conditions which gave rise to the obstruction. In this case the incisions will consist simply in extending the tracheal wound from below upwards, until the laryngeal cavity is exposed. If tracheotomy has not already been done, it may occasionally be desirable that it should be performed previously, in order that the subsequent thyrotomy may be accomplished, without the danger of too much blood escaping into the trachea.

For this purpose Trendelenberg has devised an instrument especially designed for use, in operations about the upper air-passages. This apparatus, shown in Fig. 172, consists of an ordinary tracheal tube, around the tracheal end of which there is fitted a piece of distensible rubber tubing about an inch in length, fastened firmly at each end to the canula, rendering the space between the rubber tubing and the silver tube air-tight. Communicating with this space is a small tube passing down within the canula, projecting beyond its cervical end, and provided with a stop-cock. By means of an air-bulb attached

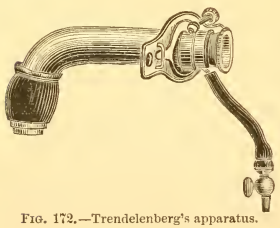

Fig. 172.—Trendelenberg's apparatus.

to the cervical end of this small tube, air can be pumped into the distensible rubber tube for the purpose of distending it. The working of this is evident. After the canula has been inserted into the trachea, the rubber tube is inflated by means of the air-bulb within the trachea, thus plugging and packing the space between the canula and the wall of the trachea, and completely preventing the possibility of the blood trickling from the wound into the air-passages. By this device the operator is saved the annoyance of all reflex symptoms such as coughing, choking, retching, etc., which are caused by the flow of the blood into the trachea. This device of Trendelenberg's is an ingenious one, and one which will often prove of great service in not only thyrotomy, but in any of the operations about the larynx which involve incision into the air-passages from without. The serious difficulty, however, in its use, is that it is not well tolerated. In two cases in which I have used it, the inflation of the rubber tube gave rise to such violent attacks of dyspnœa that it had to be abandoned. The pressure from within outward, on the wall of the trachea, seemed to excite a reflex spasm, which caused total arrest of all respiratory movements, and that, too, while the patients were under the influence of an anæsthetic. That this is not usually the case, however, is evidenced by the number of operations reported, in which Trendelenberg's apparatus has been used successfully.

Dr. Lange, of this city, in an operation for extirpation of the larynx (Chap. XXIV., Case XXII.), resorted to the device of wrapping the tracheal end of an ordinary canula with punk, and inserting it into the trachea, thus providing a means of completely plugging the space between the sides of the canula and wind-pipe, which served the purpose of arresting the flow of blood into the air-passages, without causing irritation or spasm. Trendelenberg's apparatus, it may be noted, is also provided with a cone, fitted to the end of a rubber tube, which is connected with the cervical end of the tracheal canula. By this means the administration of the anæsthetic can be easily kept up at a distance from, and entirely out of the way of the operator.

Sub-Hyoidean Pharyngotomy.

This operation was first performed in 1859, by a French surgeon, Dr. Prat, for the removal of a large growth on the under surface of the epiglottis. The steps of the operation are as follows: a transverse incision about two and a half inches in length is made about a quarter of an inch above the upper border of the thyroid cartilage. The dissection is then carried through the superficial fascia, and the internal fibres of the platysma myoides, sterno-hyoid, and thyro-hyoid muscles, down to the thyro-hyoid membrane, which being cut through and the mucous membrane reached, an opening is made into the pharynx through the fold of membrane which forms the glosso-epiglottic ligament. The epiglottis is then seized and drawn out through the wound, when access to the cavity of the larynx will be obtained.

This operation is mainly of value in those cases in which large growths or foreign bodies are so situated in the upper portion of the larynx, or in the pharynx, that they present insuperable obstacles to the endo-laryngeal operation. As will be easily perceived, these cases are necessarily very rare, hence it is not probable that the operation will be often resorted to.

CHAPTER XXIV.

EXTIRPATION OF THE LARYNX.

MALIGNANT disease in the larynx is amenable only to three methods of removal; by the endo-laryngeal method, by thyrotomy, and by resection or extirpation of the organ. As already stated, the endo-laryngeal method fails utterly in accomplishing the object. In thyrotomy it would seem that we possess a means of reaching these growths by which they might be entirely eradicated; unfortunately, however, clinical experience teaches that almost invariably there is a recurrence of the disease sooner or later after the operation. In view of this fact, Czerny, in 1870, suggested the feasibility of the complete removal of the larynx, the suggestion being based on a series of experiments on the lower animals; and in 1873 Billroth put in practice this daring procedure for the first time on the human subject. The operation has been performed twenty-three times at the present writing, and the records of the cases, with their ultimate results, are so far before us that we may form some true estimate of its promise and justifiability. The procedure is so novel, and to one's first impression, so hazardous, that surprise is excited that success should have attended the operation, even in the small proportion of cases in which such success has been reported; or in fact, that so large a proportion of patients should have survived the removal of so important an organ.

Perhaps a fairer estimate of the operation, and its proper place among surgical procedures will be attained by a brief account of the reported cases:

CASE I.—The first operation was performed by Billroth on November 11, 1873, on a man aged fifty, suffering from an epithelioma involving the upper ring of the trachea and the whole of the larynx. The tumor had so far occluded the air-passages that the trachea had been opened some months before Billroth performed his operation. The whole larynx and two rings of the trachea were removed. The immediate result

was successful and the patient was fitted with Gussenbauer's artificial vocal apparatus, by means of which he could converse in quite a distinct, though monotonous tone of voice. The disease recurred at the end of four months, and the patient died seven months after the operation.

CASE II.—The operation was done by Heine, on April 28, 1874, on a man, aged fifty, with a carcinoma of the larynx. The whole organ was removed successfully, and the patient survived six months, but finally succumbed to a recurrence of the disease.

CASE III.—The third extirpation of the larynx was done by Maas, of Breslau, June 1, 1874, who operated on a man, aged fifty-seven, suffering from an adeno-fibroma carcinomatosum. The whole larynx was removed, but the patient died on the fourteenth day, of pneumonia.

CASE IV.—Schmidt, of Frankfort, operated August 12, 1874, on a man, aged fifty-six, suffering from an epithelial carcinoma of the larynx. The whole of the organ was removed excepting the epiglottis, but the patient died on the fourth day.

CASE V.—Billroth, on November 11, 1874, performed his second operation. The patient was a man, aged fifty-four, who had suffered for a year from a carcinoma of the larynx. At the time of the operation the mass almost entirely occluded the rima glottidis. He also manifested in a marked degree the cancerous cachexia. The whole larynx was removed, but the patient succumbed on the fourth day from broncho-pneumonia.

CASE VI.—Schönborn, of Königsberg, operated, January 22, 1875, on a man, aged seventy-two, suffering from a carcinoma of the larynx, removing the whole of the organ. The patient died on the fourth day from pneumonia, with gangrene of the lung.

CASE VII.—The most successful case yet recorded is that of Bottini, of Turin, who operated on a man, aged twenty-four, suffering from a sarcoma of the larynx. In spite of a very serious hemorrhage, and also an attack of erysipelas, which set in during the healing of the wound, the patient made a perfect recovery, and on November 26, 1878, was acting as a postman in Miazzina, and was in the enjoyment of the best of health.

CASE VIII.—Langenbeck, on July 21, 1875, operated on a man, aged fifty-seven, suffering from a carcinoma, involving the whole larynx and extending to the base of the tongue. The operation is described as a "truly methodical and scientific surgical masterwork, the extirpation being done as smoothly as an anatomical dissection." The whole larynx, the hyoid bone, and portions of the tongue, pharynx, and œsophagus were removed, together with a collection of diseased lymphatics in the submaxillary region. Forty-one vessels were ligated, among which were the external carotid, lingual, external maxillary, and superior thyroid arteries of each side. Each vessel was ligated before it was divided, and consequently the hemorrhage was comparatively slight. The patient made a good recovery, and enjoyed relatively good health. On November 12th the disease having recurred in the lymphatic glands of the neck, a second operation was performed for their removal, resulting in the death of the patient, from collapse, on November 23d, four months after the first operation.

CASE IX.—Maas performed his second operation on February 5, 1876, removing the whole larynx in a man, aged fifty years, suffering from an epithelial cancer. The patient made a good recovery, and was discharged wearing an artificial vocal apparatus. The disease recurred at the end of three months at the base of the tongue. Declining another operation, he died from hemorrhage from the ulcerated surface six months after the first operation.

CASE X.—Gerdes, of Jever, operated on March 30, 1876, on a man, aged seventy-six, suffering from an epithelial cancer. The whole larynx was removed, but death followed at the end of four days, from exhaustion.

CASE XI.—Reyher, of Dorpat, in May, 1876, operated on a man, aged sixty, suffering from a diffuse carcinoma of the larynx. The whole organ was removed excepting the epiglottis. The patient died on the eleventh day from catarrhal pneumonia.

CASE XII.—Kosinsky, of Warsaw, operated March 15, 1877, on a woman, aged thirty-six, suffering from an epithelial cancer. The whole larynx was removed. The patient made an excellent recovery, and at the end of the seventh week was presented to the medical society of Warsaw, wearing an artificial vocal apparatus, by means of which she conversed with comparative facility. The disease, however, recurring, she died nine months after the operation.

CASE XIII.—Bottini, of Turin, on August 29, 1877, performed his second operation on a man aged forty-eight, suffering from an epithelioma of the larynx. The whole larynx, with a portion of the anterior wall of the œsophagus, was removed. The galvano-cautery was used in this case, rendering the operation almost bloodless. The patient, however, died on the third day from pneumonia.

CASE XIV.—Foulis, of Glasgow, on September 10, 1877, removed the whole of the larynx, with the exception of a small part of the arytenoid cartilages, in a man aged twenty-eight, suffering from a sarcoma. The operation was entirely successful, the patient making a perfect recovery. The artificial larynx shown in Fig. 175 was devised for this case, and worn with comfort, the man being able to carry on conversation with ease. He occupied a position as telegraph clerk after the operation, but developing pulmonary disease, he succumbed to that affection on March 1, 1879, nearly eighteen months after the removal of the larynx. There was no return of the laryngeal disease.

CASE XV.—Wegner, of Berlin, operated, September 16, 1877, on a woman aged fifty-two, with a carcinoma of the larynx, the size of a walnut, springing from the right ventricle. The whole larynx was removed with the exception of the epiglottis. The woman made a perfect recovery, and on April 12, 1878, she was presented at the Seventh Annual Congress of German Surgeons, wearing an artificial larynx by means of which she conversed with ease and facility.

CASE XVI.—The elder Von Bruns, of Tübingen, on January 29, 1878, removed the whole larynx in a man aged fifty-four, suffering from an epithelial cancer. This patient made a good recovery, but finally succumbed to a recurrence of the disease, nine months after the operation.

CASE XVII.—Rubio, on May 11, 1878, operated on a man aged forty-one, suffering from perichondritis of the laryngeal cartilages resulting in necrosis. The whole larynx was removed. The patient died on the fifth day from collapse.

CASE XVIII.—Billroth performed his third operation on July 7, 1878, on a man aged fifty, suffering from an epithelial cancer involving the left side of the larynx. The diseased half of the organ was removed and the patient made an apparently excellent recovery, but there was subsequently a recurrence of the disease, under which he succumbed ten months after the operation.

CASE XIX.—Czerny, on August 24, 1878, operated on a man aged forty-six, suffering from a round-cell sarcoma, the size of a walnut, attached to the right ventricular band. The tumor so far occluded the laryngeal cavity that tracheotomy had been performed. The whole larynx was removed and the man made an excellent recovery. This patient was quite well at a recent date, and wearing an artificial larynx which enabled him to converse with facility and distinctness.

CASE XX.—Billroth performed his fourth operation on February 27, 1879, on a woman aged forty-three, suffering from an epithelioma of the pharynx and larynx. The whole organ was removed with portions of the pharynx and œsophagus. She made a good recovery, but died at the end of six weeks, from the passage of a bougie into the mediastinum, which was being introduced into the œsophagus.

CASE XXI.—Caselli, of Reggio-Emilia, operated, September 29, 1879, on a young girl aged nineteen, who had for a year suffered from a progressive "lymphatic granuloma," involving the fauces and larynx, which had become so exquisitely painful, and so far interfered with deglutition and respiration as to render the operation imperative. The whole larynx was removed, together with the soft palate, tonsils, base of the tongue, pharynx, and œsophagus, down to a point opposite the fifth cervical vertebra. The operation was done with the galvano-cautery, a previous tracheotomy having been performed, and consumed three hours and ten minutes. But few vessels required ligation, and the loss of blood was trifling. A modification of Gussenbauer's artificial vocal apparatus was subsequently introduced, and at present writing the patient is doing well and converses with facility.

CASE XXII.—Dr. Lange, of New York, performed the first extirpation of the larynx done in America, on October 12, 1879. The patient was a man aged seventy-four, who had suffered for over a year from what was discovered to be a mixed round and spindle-celled sarcoma, apparently springing from the right ventricle. The tumor had developed so rapidly that tracheotomy had become necessary eight months previously. The whole larynx, with a portion of the anterior wall of the œsophagus, was removed, and a month later an artificial larynx was inserted. The case seemed to progress favorably for four months, but from that time the administration of nourishment became difficult, on account of the sinking in of the œsophagus and trachea, and the patient succumbed on May 2, 1880. The immediate cause of death was asthenia, although a few weeks previously there had developed a return of the disease. At the time of death, the œsophagus and trachea had sunk one and a half inches below the sternum.

CASE XXIII.—Dr. Gerster, of New York, on March 5, 1880, operated on a man aged fifty, for a sarcoma involving the right side of the larynx, which had been growing for over a year, and which had rendered tracheotomy necessary six weeks previously. The right half of the thyroid, the whole of the arytenoid, the whole of the epiglottis, a portion of the base of the tongue, together with the right side of the pharynx, including the tonsil, were removed. The patient made an excellent recovery, and at present writing is doing well.

We thus find that the operation has been done, in all, twenty-three times, and that of these, sixteen were for carcinoma of the larynx, five for sarcoma, one for perichondritis with necrosis of the laryngeal cartilages, and one for a lymphatic granuloma. Of the sixteen cases of carcinoma, seven died, as the result of the operation, one (Case XX.) died at the end of six weeks, from an accident, seven succumbed to a recurrence of the original disease, at periods varying from four to ten months after the operation, while in one case only (Case XV.) was the operation really successful. In other words, with this single exception, every patient suffering from malig-

nant disease of the larynx, who survived the operation a sufficient length of time, succumbed, sooner or later, to a recurrence of the disease; and, furthermore, the longest time to which the fatal issue was deferred, was ten months. In the one case in which the operation succeeded (Case XV.), the tumor was small and was confined to one side of the laryngeal cavity.

Turning now to the remaining seven cases, we find that the operation was done in five cases for sarcoma, in one (Case XXI.) for a "lymphatic granuloma," and in one (Case XVII.) for perichondritis and necrosis of the laryngeal cartilages. This latter patient died, as the result of the operation. One case (Case XXII.) of sarcoma died from asthenia, seven months after the operation, while the remaining four cases of sarcoma and the one case of granuloma were entirely successful. We thus see that of these seven cases of extirpation of the larynx for non-malignant disease, five were successful, the original disease seeming to have been entirely eradicated. In Foulis' case (Case XIV.) it is to be remembered that although the patient died eighteen months after the operation, his death was due to pulmonary disease, and not to any recurrence of the laryngeal affection.

The conclusions which may be drawn from this analysis, it seems to me, are very plain as regards laryngeal cancer, unless the future of this operation shall show an entirely different series of results. If the object in view be the eradication of the disease, we must regard it as, to a great extent, a failure, for a percentage of cures of one case in sixteen does not warrant the resort to an operation of so serious a nature. If the object be the prolongation of life, it would seem an open question whether this has been accomplished, when the longest term of life secured has been but ten months; bearing in mind also the success which often attends our improved means of topical applications in even so serious an affection as carcinoma of the larynx.

It should be said, however, that in the very large proportion of these cases the operation was done as almost a last resort for the relief of urgent symptoms. In the single case of successful removal of a cancerous larynx, the tumor was small and the operation was done early in its development. The suggestion from this fact should not be overlooked; that in

the late stages of malignant disease of the larynx the radical operation is almost hopeless; in its early stages there is such fair promise of success as to warrant the attempt. It is our last resort, and it failing, we are helpless to cope with this terrible disease. Confining our attention, however, to those cases in which the operation was done for the removal of non-malignant tumors, the success of the procedure has been most brilliant, and the operation has been well designated as "one of the greatest triumphs of modern surgery." Of the seven cases there were five cures, one death from the operation, and one death seven months later, from an indirect result of the operation.

The Operation.—As regards the operation itself, it should be looked upon as an extremely difficult and intricate procedure rather than an essentially hazardous one; and, moreover, one in which hidden dangers, and unforeseen accidents or obstacles are liable to present at any time.

In general the method of operating is as follows: an incision is made from the hyoid bone to the sternal notch, and the larynx and trachea exposed partially by dissection, and in part by crowding the tissues to the side with the finger and handle of the scalpel. The trachea is then separated from its attachments, lifted and cut through. A Trendelenberg canula (Fig. 172), or some similar device is inserted into the open trachea, by means of which the anæsthetic is administered and the subsequent steps proceeded with. These consist in severing the further attachments of the larynx, exercising extreme care to avoid button-holing the œsophagus, and carrying the dissection as far as the disease may be found to extend. In Caselli's case (Case XXI.) the base of the tongue, soft palate, and tonsils were involved, and hence their attachments were severed by operating through the mouth, a gag being inserted between the teeth. In Langenbeck's case (Case VIII.), portions of the œsophagus, the hyoid bone, the base of the tongue, and a portion of the pharynx were removed, the operation requiring forty-one ligatures. This simply illustrates how the operation may be comparatively simple in one case, while in another it may be an extremely intricate and complicated one.

The Artificial Vocal Apparatus.—In the course of five or six weeks after the removal of the larynx, the parts will, as a rule, so far have healed as to tolerate the presence of an artifi-

cial larynx, by means of which a useful though entirely monotonous voice will be afforded, and by which the patient will

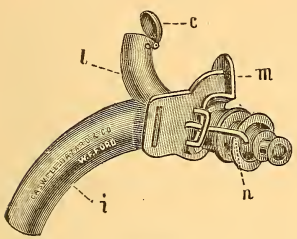

Fig. 173.

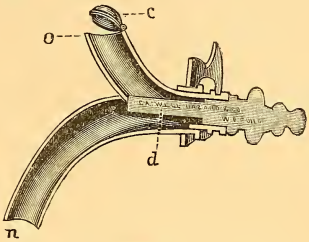

Fig. 174.

Fig. 173.—Gussenbauer's artificial vocal apparatus: *i*, tracheal tube; *l*, oral tube; *m*, cervical plate; *n*, catch for holding reed-plate in position; *c*, artificial epiglottis.

Fig. 174.—Gussenbauer's artificial vocal apparatus in section: *n*, tracheal tube; *o*, oral tube; *c*, artificial epiglottis; *d*, reed-plate.

be enabled to carry on conversation with comparative facility. The first instrument of this character which was devised was that of Gussenbauer, Figs. 173, 174. This instrument consists of an ordinary double tracheal canula (Fig. 173, *i*), on the upper side of which is an oval fenestrum through which there is passed a tube (Fig. 173, *l*,) similar in shape to the tracheal tube, but passing upward toward the oral cavity. At the upper extremity of the tube there is filled a movable cap (*c*), which acts as an artificial epiglottis, preventing the entrance of mucus and particles of food into the air-passages. In this manner there is really nothing more accomplished than the establishment of a channel of communication between the lungs and mouth, the upper end of which is protected by the artificial epiglottis, and which has also an external opening upon the neck. The apparatus is completed by the insertion into the cervical opening of a plate

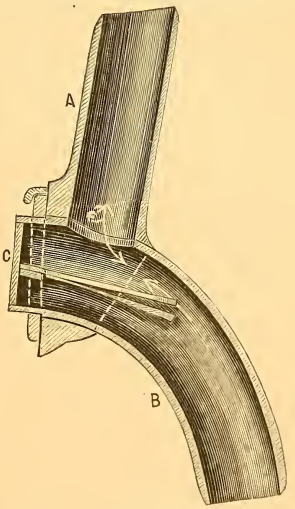

Fig. 175.—Foulis' modification of Gussenbauer's artificial vocal apparatus: *A*, the upper tube; *B*, the lower or tracheal tube; *C*, the vocal reed. (Mackenzie).

containing a reed (Fig. 174, *d*.) This is held in place by a catch (Fig. 173, *n*). The cervical end of the reed-plate is cylindrical and fills the calibre of the opening into which it is inserted.

The outgoing current of air from the lungs thus passes into the oral cavity, being thrown into monotonous vibrations by the reed, and these are formed into articulate language by the tongue, soft palate, etc. In this apparatus the lower tube is first inserted, but the subsequent introduction of the upper tube seems to be attended with such difficulty that Foulis devised an arrangement by which the upper tube is first placed in position, after which the tracheal tube is passed through its lower extremity. This device is shown in Fig. 175. As in the Gussenbauer apparatus, the reed is passed into the cervical opening in a separate plate which fits into grooves on the sides of the canula.

These devices are described as illustrative of the general principles on which the artificial vocal apparatus is constructed. In each case in which the device has been made use of, modifications have been rendered necessary by the varying requirements of the individual patient, and the extent to which the parts had been removed.

APPENDIX.

THERE is given below a number of formulæ of such remedies as I have found of value, as topical agents in the treatment of the various affections of the upper air-passages. The list is not a large one, as I do not regard the selection of any special remedy as of so much importance as the thoroughness with which it is applied to the part. There is also added a number of formulæ for cough mixtures, in use at the Bellevue Throat Clinic.

AQUEOUS SOLUTIONS.

Cleansing Solutions.

In all forms of catarrhal, follicular, and ulcerative diseases of mucous membranes, the first essential in topical treatment is the thorough cleansing of the diseased surface preparatory to the application especially indicated. These may be applied by means of the douche, post-nasal syringe, or the atomizer.

(DOBELL.)

℞. Acidi carbolici..... gr. j.
Sodæ biborat.,
Sodæ bicarb.....āā gr. ij.
Glycerinæ..... ʒ j.
Aquæ .....ad. ℥ j.
M.

℞. Acidi carbolici..... gr. j.
Sodii chloridi..... gr. iv.
Aquæ..... ℥ j.
M.

℞. Acidi salicylici..... gr. j.
Sodæ bicarb..... gr. iv.
Aquæ..... ℥ j.
M.

℞. Potassæ bicarb..... gr. iv.
Aquæ..... ℥ j.
M.

℞. Aquæ calcis,
Aquæ.....āā ℥ j.
M.

℞. Potassæ bicarbonatis..... gr. iv.
Potassæ chloratis..... gr. ij.
Aquæ..... ℥ j.
M.

℞. Sodæ phosphatis..... gr. v.
Aquæ..... ℥ j.
M.

℞. Ammonii mur..... gr. iv.
Aquæ..... ℥ j.
M.

℞. Acidi carbolici..... gr. ij.
Glycerinæ..... ℥ j.
Aquæ.....ad. ℥ j.
M.

Astringent Solutions.

By an astringent is meant any remedy which when locally applied to a mucous membrane has the effect to control the excess of discharge, and at the same time diminish the abnormal blood-supply by its direct constringent action on the vessels. These may be applied by means of the syringe, douche, atomizer, sponge, or brush. My preference is decidedly in favor of the atomizer, as depositing the agent on the diseased surface in a manner which is the least irritating of all methods.

At the head of the list of these agents is placed nitrate of silver. We possess no remedy which is so valuable for its astringent action, but the serious mistake which is made, is in applying it in solutions of too great strength. It should never be used in a stronger solution than gr. xx.— ʒ j., and rarely stronger than gr. x.— ʒ j. It possesses a somewhat stimulating action, which contraindicates its use in acute catarrhal inflammations. Its especial value is in chronic inflammatory affections, and may be used both in simple catarrhal and follicular disease of the membrane. It possesses alterative and resolvent properties which render it useful in the latter form of disease.

Argenti nitrat	gr. ij.—xx. to ʒ j.
Zinci sulphatis	gr. v.—xv. to ʒ j.
Ferri et aluminis sulph	gr. v.—x. to ʒ j.
Acidi tannici	gr. x.—xx. to ʒ j.
Zinci chloridi	gr. v.—x. to ʒ j.
Potassæ chloratis	gr. x.—xx. to ʒ j.
Alum	gr. v.—x. to ʒ j.
Glycerinæ tannat	ʒ ss.— ʒ j. to ʒ j.
Cupri sulphat	gr. iij.—x. to ʒ j.
Ferri sulphat	gr. ij.—v. to ʒ j.

Stimulating Solutions.

By this is meant a remedy which, when applied to the surface of a mucous membrane, excites for the time an excessive discharge of thin mucus or sero-mucus. When this subsides, the membrane is left in a state of healthier functional activity. These agents are indicated in atrophic or dry catarrh, whether of the pharynx or nasal cavities.

Tinct. sanguinaria	ʒ ss.— ʒ j. to ʒ j.
Tinct. iodini	♏ ij.—x. to ʒ j.
Potass. iodidi	gr. iij.—x. to ʒ j.
Potass. bromidi	gr. x.—xx. to ʒ j.
Infus. picis liquidæ	ʒ j.— ʒ iij. to ʒ j.
Vini ipecac	ʒ ss.— ʒ j. to ʒ j.
Tinct. belladonnæ	ʒ ss.— ʒ j. to ʒ j.
Ammonii chloridi	gr. v.—x. to ʒ j.
Acidi carbolici	gr. x.—xx. to ʒ j
Creasoti	♏ iij.—vi. to ʒ j

Sedative Solutions.

These are for use in connection with the preceding stimulating or astringent remedies, or following them in case their application gives rise to pain or irritation. Sedatives are especially indicated also in acute affections, as exerting a direct controlling influence on the morbid process.

Morphia sulphat.	gr. v.—xx. to ℥ j.
Aq. ext. opii.	gr. x.—xl. to ℥ j.
Ext. hyoscyami.	gr. x.—xl. to ℥ j.
Ext. belladonnæ.	gr. ij.—vi. to ℥ j.
Acidi hydrocyanici dil.	♏ ij.—x. to ℥ j.
Infus. lupulini.	q. s.
Decocti papaveris.	q. s.
Aquæ laurocerasi.	q. s.
Aquæ amygdalæ amaræ.	q. s.

Alterative and Resolvent Solutions.

These are certain remedies which act locally to produce absorption of the results of a chronic morbid process, which has led to the deposit in the deep layers of the mucous membrane, or in the follicular walls, of neoplastic tissue, provided the new deposit has not become too firmly organized.

Argenti nitratis	gr. j.—iij. to ℥ j.
Zinci chloridi	gr. ij.—iv. to ℥ j.
Hydrarg. chloridi corrosivi.	gr. j.—ij. to ℥ j.
Ammonii chloridi.	gr. v.—x. to ℥ j.
Liq. potassæ arsenitis.	♏ ij.—x. to ℥ j.
Tinct. iodi. co	♏ iij.—x. to ℥ j.

Disinfectant Solutions.

These are intended for use in cases of nasal catarrh attended by fetid or offensive discharges. They are also of value in ulcerative action in the fauces, or in any affection attended with fetor.

Carbolic acid is a remedy of varied usefulness as a topical agent. Its action, in the milder strength of gr. j.—℥ j., is as a

cleansing and disinfectant agent; in the strength of gr. x.—xx. to ℥j., it is a decided stimulant; in the still stronger solution of ʒij.—℥j. to ℥j., it is an escharotic. Its use, therefore, is as an aid to other remedies, in cleansing or disinfecting a diseased membrane preparatory for the more especially indicated remedy. It is of very doubtful value as a topical application in any acute form of inflammation. It should be placed among the most valuable of disinfectants. Other drugs may be noted, as follows:

Potass. permanganat	gr. x.—ʒss. to ℥j.
Acidi salicylici	gr. ij.—iv. to ℥j.
Sodæ salicylatis	gr. v.—x. to ℥j.
Liq. sodæ chlorinatæ	ʒss.—ʒj. to ℥j.
Acidi acetic	♏ x.—xv. to ℥j.
Acidi sulphurosi	♏ iij.—v. to ℥j.
Zinci sulpho-carbolat	gr. j.—iij. to ℥j.

Powders or Snuffs.

The action of a powder or snuff on a mucous membrane differs from an aqueous solution only in that it is to an extent more permanent and more prolonged. On the other hand, it is not so evenly diffused, nor does it probably reach the parts so thoroughly, especially in the tortuous passages of the nose. In the preparation of a snuff there is substituted for the water, in the aqueous solutions already given, a light neutral powder, in which the astringent, sedative, or stimulating agent may be incorporated in the same proportion as that given. A powder, when applied to a mucous membrane, is dissolved in its mucus, and in this state of solution is absorbed, and thus produces its intended effect. Any of the aqueous solutions already given may be administered, therefore, in the form of a snuff, by substituting for the water lycopodium, pulv. amyli, pulv. acaciæ, sacch. alb., magnesiæ carb., or any other neutral powder. In addition, there are given a few formulæ, which have been found efficient.

Astringent Powders.

℞. Argenti nitrat ..... gr. ij.
Bismuth. subcarb ..... ʒj.
M.

℞. Hydrastin ..... gr. x.—℥ ss.
Lycopodii..... ℥ ss.
M.

℞. Hydrastin..... ℥ ss.
Pulv. camphoræ..... gr. x.
Pulv. acaciæ.....ad. ℥ j.
M.

℞. Lupulin ..... ℥ j.
Bismuth. subcarb..... ℥ vij.
M.

Stimulating Powders.

℞. Pulv. galangæ..... ℥ ij.—℥ ss.
Pulv. amyli.....ad. ℥ j.
M.

℞. Pulv. sanguinariæ..... ℥ ij.—℥ ss.
Lycopodii.....ad. ℥ j.
M.

℞. Pulv. belladonnæ..... ℥ j.—℥ ij.
Pulv. acaciæ.....ad. ℥ j.
M.

℞. Pulv. myrrhæ..... ℥ j.—℥ iij.
Pulv. amyli.....ad. ℥ j.
M.

Alterative Powders.

℞. Iodoformi..... ℥ vi.
Lycopodii..... ℥ ij.
M.

℞. Iodoformi..... ℥ j.—℥ ij.
Pulv. camphoræ..... ℈ j.
Pulv. amyli.....ad. ℥ j.
M.

℞. Hydrarg. chloridi mitis..... ℥ ss.—℥ j.
Sacch. alb.....ad. ℥ j.
M.

℞. Hydrarg. rubri oxidi,
Hydrarg. chloridi mitis.....āā ʒ ss.
Sacch. alb.....ad. ℥ ss.
M.

Inhalations.

The essential difference between an inhalation and the application of an atomized fluid lies in the fact, that in the one case the agent is carried into the air-passages by the act of inspiration, and thereby reaches not only the larynx, but also the trachea and even the bronchi; whereas, in applying a remedy by means of the atomizer it does not, as a rule, reach farther than the vocal cords, as the rima glottidis is usually closed during the manipulation of applying the spray. In those cases of laryngeal disease attended with cough and irritation of the air-passages inhalations are of especial value. In these cases the trachea and probably the larger bronchi are involved in the morbid action, and are reached and acted upon by remedies used in this manner.

Inhalations may be used by any of the different forms of spray-producers. It is an excellent plan to allow the atomizer to play in a large glass globe to the open mouth of which the patient applies his mouth. In this manner the finer particles of the fluid are carried into the trachea and bronchi. Any of the remedies given under the head of aqueous solutions may be used in this manner according to the indications. In chronic inflammatory affections, cold inhalations only should be given. In acute affections the fluids used may be atomized by the steam atomizer shown in Fig. 66. Another form of inhalation consists in inhaling the active principles of certain drugs which have been volatilized by heat. For this purpose the inhaler shown in Fig. 67 may be used, or a simple cup or open mouth bottle. In the remedies given below a teaspoonful of the mixture is to be placed in the cup and a pint of hot water poured upon it, and the patient directed to inhale the vapor as long as it is given off. In this manner there may be used the following, their action being first slightly stimulating, but this is followed by a sedative effect.

℞. Creasoti..... ʒ j.
Tinct. benzoini co..... ℥ j.
M.

Ol. resin lupulin..... q. s.
Tinct. opii camph..... q. s.
Tinct. opii..... q. s.
Creasoti..... ℥ ij.—℥ j.
Acidi carbolici..... ℥ ij.—℥ j.
Ol. copaibæ..... ℥ ij.—℥ j.
Ol. cubebæ..... ℥ ij.—℥ j.
Ol. terebinth..... ℥ ij.—℥ j.
Tinct. iodini..... ℥ j.—℥ j.
Ol. pini Sylvestris..... ..... ♏ xl.—℥ j.

In these latter the agent is to be diluted with alcohol, as above.

Cough Mixtures.

The propriety of administering a cough mixture in all cases of mere throat disease, to allay a slight cough or irritability which may exist, is somewhat doubtful; and yet it will in many cases become necessary.

It is a very ancient usage to administer remedies for the alleviation of a cough in a syrup—indeed, the terms cough mixture and cough syrup are synonymous. This practice should be avoided. Syrups are very liable to produce disorder of the stomach, hence, when we remember the intimate sympathy existing between the stomach and the throat, it is easy to understand how a cough syrup administered to relieve a cough attendant upon a throat catarrh, may serve to aggravate rather than alleviate the disease.

℞. Codeiæ..... gr. ij.
Acidi hydrocyanici dil..... ℥ ss.
Tinct. tolutani..... ℥ vi.
Aquæ.....ad. ℥ iv.
M. Sig.—One teaspoonful three or four times daily.

℞. Potass. bromidi..... ℥ ss.
Potass. cyanidi..... gr. iv.
Fl. ext. prun. virginiani..... ℥ vi.
Aquæ..... .....ad. ℥ iv.
M. Sig.—As above.

℞. Codeiæ..... gr. iij.
Potass. cyanidi..... gr. iv.
Tinct. tolutani..... ʒ j.
Aquæ.....ad. ʒ iv.
M. Sig.—Same as above.

℞. Ammonia carb..... gr. xx.
Tinct. opii camph..... ʒ iij.
Tinct. scillæ..... ʒ ij.
Infusi senegæ.....ad. ʒ iv.
M. Sig.—Same as above.

℞. Pulv. cubebæ..... ʒ ijss.
Tinct. tolutani,
Mucil. acaciæ.....āā ʒ j.
Aquæ..... ʒ ij.
M. Sig.—Same as above.

℞. Fl. ext. cubebæ..... ʒ iij.
Glycerinæ..... ʒ iss.
Aquæ.....ad. ʒ iv.
M. Sig.—Same as above.

℞. Mur. ammonia..... ʒ ijss.
Tinct. tolutani,
Tinct. sanguinaria.....āā ʒ j.
Aquæ..... ʒ ij.
M. Sig.—Same as above.

℞. Acidi hydrocyanici dil.,
Chloroformi.....āā ʒ ss.
Tinct. hyoscyami,
Tinct. tolutani,
Aquæ camphoræ,
Mucil. acaciæ.....āā ʒ j.
M. Sig.—Same as above.

℞. Ammonia carbonat..... ʒ iij.
Spts. ether co..... ʒ j.
Fl. ext. cubebæ..... ʒ v.
Aq. amygdala amaræ.....ad. ʒ iv.
M. Sig.—Same as above.

℞. Antimonii et potassæ tartrat..... gr. ij.
Tinct. scillæ,
Tinct. sanguinariæ.....āā ℥ j.
Aquæ.....ad. ℥ iv.
M. Sig.—Same as above.

℞. Potass. nitratis..... ʒ ij.
Tinct. scillæ..... ʒ v.
Tinct. digitalis..... ʒ j.
Mucil. acaciæ..... ℥ j.
Aquæ.....ad. ℥ iv.
M. Sig.—Same as above.

℞. Acidi hydrobromici dil..... ℥ j.
Spts. chloroformi..... ʒ j.
Tinct. scillæ..... ℥ ss.
Aquæ.....ad. ℥ iv.
M. Sig.—Same as above.

℞. Potass. chlorat..... ʒ j.
Ext. glycyrrhizæ..... ʒ iijss.
Ammonii chloridi..... ʒ j.
Aquæ.....ad. ℥ iv.
M. Sig.—Same as above.

℞. Tinct. tolutani..... ℥ ss.
Acidi acetici..... ʒ iij.
Tinct. sanguinariæ..... ʒ vi.
Fl. ext. prun. virginiani..... ℥ ss.
Aquæ.....ad. ℥ iv.
M. Sig.—Same as above.

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